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DRAGON USER

The independent Dragon magazine

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Dragon Plus expansion

Advanced Basic programming

Dragon Joy

Communication

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DRAGON USER

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Editorial Secretary
LUCINDA LEE

Advertisement Manager
SIMON LANGSTON

Administration
GERALDINE SMYTH

Managing Editor
DAVID KELLY

Publishing Director
JENNY IRELAND

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

The New Year has always been a time for looking back on the past 12 months and attempting to sum things up — so now seems a reasonable time to sit down and think about where you and your Dragon are going.

Why did you buy your computer in the first place? As an educational tool? To play games? To mess around with code? Or maybe you just wanted to find out a bit about the new technology? Whatever the reason, well over a year after the Dragon was written off in many circles (and since then lesser computers have arrived on the scene and then vanished just as quickly — take the C16 for example), your choice of computer remains a valid one.

Education — you've only got to take a look at what the Spanish are doing to see the potential. Games — the market may not be so prolific, but the quality is there. Technical — powerful expansions and utilities abound. Curious — the Dragon's excellent Basic and the wide range of add-ons currently available should keep you occupied. So what's keeping you from using your computer? At the 6809 show, one exhibitor told me he was optimistic but, "there are a lot of Dragons out there, stuck in the loft." He could be right . . . but what on earth are they doing there!

It is a fact that in many ways there has been no better time to own a Dragon. So if you're reading this in the newsagents and haven't touched a computer for months, take a closer look inside our pages, get the computer down from the attic and treat yourself to a session on the keyboard this evening. And make 1986 the Year of your Dragon.

News desk

If you have any new products for the Dragon — software or hardware — ring the News Desk on 01-437 4343

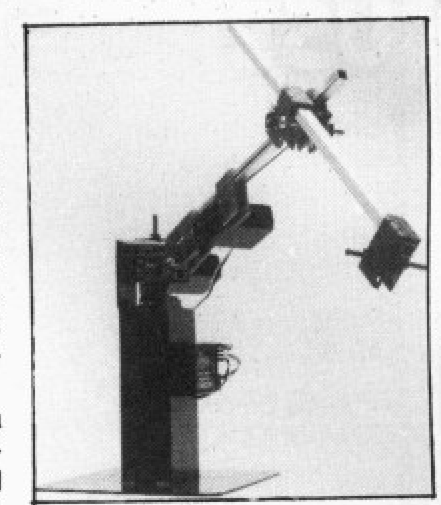
The Dragon's Arm!

Lucidate have been keeping themselves busy. After launching their Dragon's Claw digital interface and Snap-Dragon vision system, the Cambridge based company are now offering a range of low-cost peripherals for experimental Robotics. These are based on the highly successful Beasty Arm from Micro Robotics which has been available for the BBC micro and Spectrum for some time. All the control software necessary to drive the eight-channel Beasty servo controller through the Dragon's Claw is provided on cassette. The servo controller plugs into the Claw and can be used at the same time as the Snap camera, thus creating the possibility of providing vision guided control of the arm. The controller can handle up to eight standard model servos.

The actual Robot Arm is supplied in kit form and comprises a solid metal base and a collection of tubular aluminium rods and special plastic joint units. It is powered by standard radio control type model servos.

Lucidata is offering two Robotics packages, a starter pack with Beasty controller and two servos at £70 plus VAT and a complete three-axis Robot Arm kit including Beasty controller and three servos at £100 plus VAT. Both are available by Mail Order only from Lucidata Ltd, PO Box 128, Cambridge CB1 1DQ. Tel: 0223-356846. Visa and Access cards accepted.

At the same time, Lucidata are announcing a new implementation of their established Pascal System, version 3.9/P, running under Flex for the Dragon/Tandy.



The Beasty Arm

Lucidata describe the key design objective of their Pascal as user friendliness, with extensive error checking at the compiling stage and the run-time stage, with all errors being reported in English. They also claim it conforms 'very well' to the ISO standard.

It is planned to be marketed through Compusense, costing £75 plus VAT.

Road Show

Microdeal's recent ambitious Dragon Roadshow, covering Manchester, Newcastle, Leeds, Birmingham and Cardiff all within eight days seems to have gone down well with the general public and established users alike.

"The Roadshow was a great success", says Microdeal Marketing Manager Alan Hobbs, with a good level of support at almost every venue. A sparse turn-out at the Wellesly Hotel, Leeds was attributed to lack of pre-publicity.

Many new Dragons were sold — with the 32 selling for £50 (including £30 worth of software) and the 64 selling for £79.95 (including £50 of software), and Microdeal's new titles such as Trekboer and Shocktrooper proved to be popular.

Plans are already afoot for a follow-up Roadshow in the Spring. Microdeal can be contacted at 41 Truro Road, St Austell, Cornwall PL25 5JE.

Incentive convert Moon Cresta

Those old warhorses Incentive Software are set to bring out a version of that arcade classic Moon Cresta for the Dragon. This vintage shoot-'em-up, brought out by Nichibutsu in 1980 was a legend in its own time in arcade circles.

Successfully released on Spectrum and Commodore some months back, the Dragon version is being written by John Martin (author of the Ket Trilogy), and Incentive Director Ian Andrew expects it to become available towards the end of February. Available by mail order only from Incentive priced £7.95 — 54 London Street, Reading RG1 4SQ. Tel: (0734) 591678.

Stop Press!

The Third 6809 show attracted an estimated 7,000 users . . . full show report in next issue.

Week-end away

The shortbreak holiday for Dragon enthusiasts which took place in mid Wales over the last weekend of October proved to be an unqualified success for all participants, some of whom were not even Dragon owners! They had travelled from various parts of England and even Scotland to Llanfyllin in Powys for this first off Dragon-meet.

First off it was, and judging by the response a second similar gathering will be taking place in the early Spring of 1986. Right from the start participants enjoyed their common interest — 6809 computing, ideas and methods were exchanged over dinner and late into the early hours of the morning!

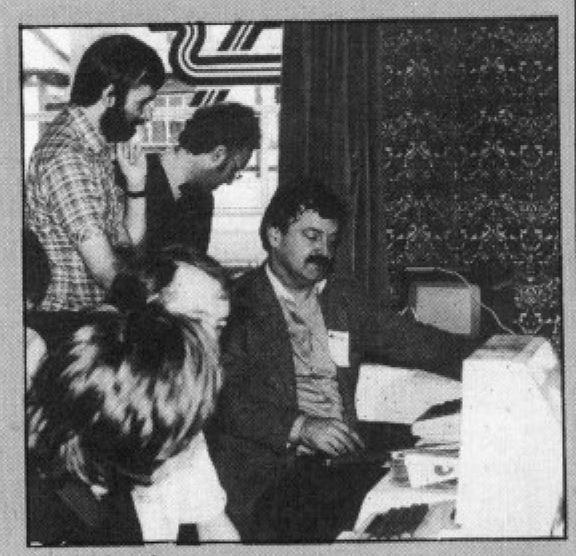
After very little sleep the group reassembled to hear Mr Ted Opyrchal, managing director of Compusense, give an informal talk on the current situation of Dragon and its development.

After a brief pause Mr Rod Lloyd, Technical Director of Race Electronics' took over and explained their company's link with Dragon which dates back to the days when they built not only the Dragon but also the Beeb.

The afternoon lived up to expectations with plenty to keep our interest including a brief talk given by Mr Stan Opyrchal, Ted's brother and Technical Director of Compusense. He outlined the use of Comms software, modems, bulletin boards and electronic mail/telex facilities.

An eventful evening was spent 6809-ing — an early night was had by all — 1.30 am!

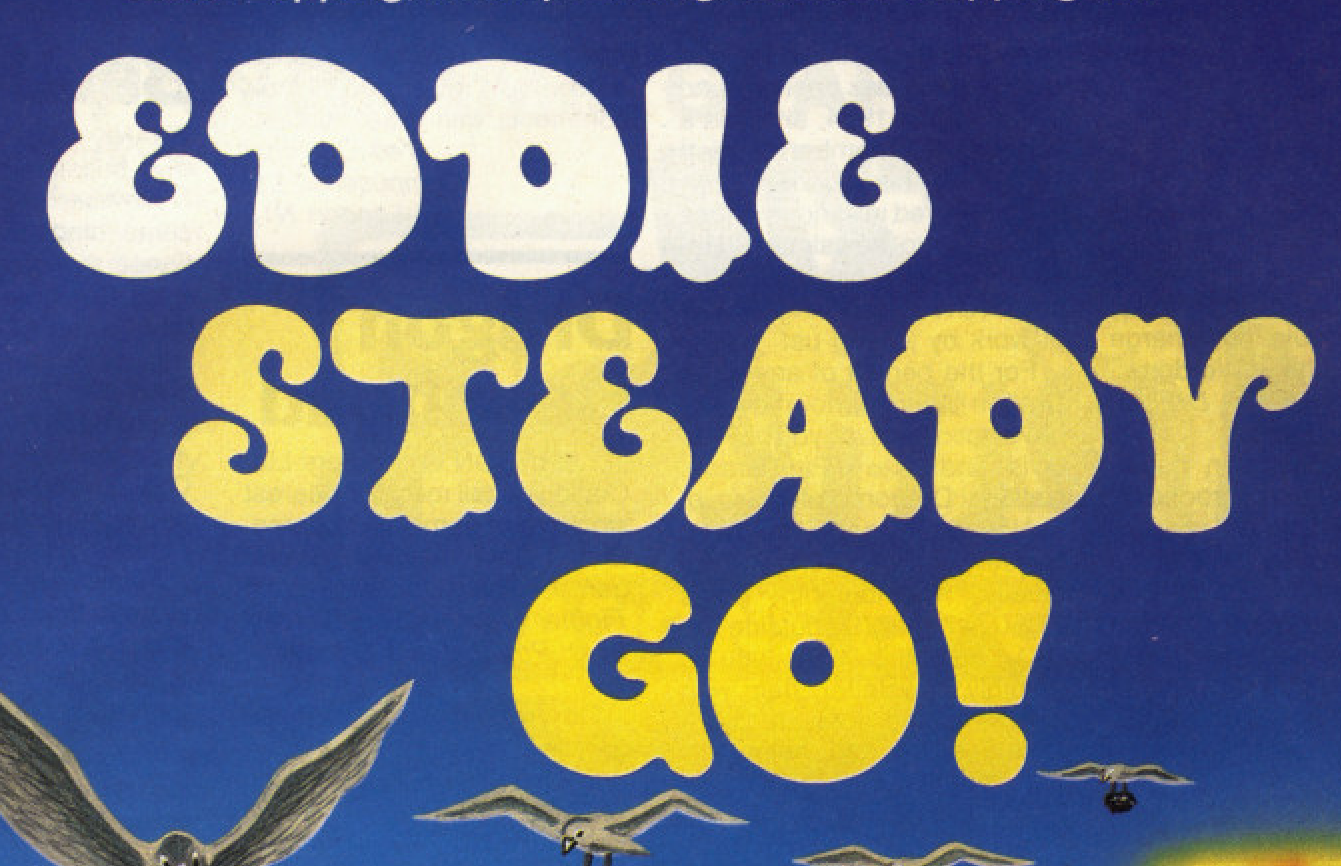
Then next day a planned visit was cancelled — once again the groups gathered around the eight Dragons to savour every last minute of the weekend. Until the next time.



Rod Lloyd

There will be a next time, and we would happily welcome Tandy and other 6809 devotees — and friends. For further details contact Bob Morgan, Marketing/Information Officer, Mid-Wales Tourism Council, Canolfan Owain Glyndwr, Machynlleth, Powys.

HERE IT IS ! The 22 screen, 60 level, See Sawing, Frog Slurping, Lift Catching, Apple Munching, Mind Blowing, Eddie Guiding, Arrow Dodging, Mountain Jumping, Laser Zapping, Airship Gazing, Boulder Hopping ......



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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Money Matters

WITH REFERENCE to Craig Henderson's letter (*Dragon User*, November), I disagree with his opinion that Peter Whittaker should not charge £3 for a cassette of Wordproc, also published in *Dragon User*.

Has Mr Henderson considered the cost of producing cassette programs for readers of a magazine as popular as *Dragon User?*

As Mr Henderson informs us, cassettes do indeed cost 50p. But padded envelopes cost another 50p each, and a 24p stamp is also necessary. That brings the total cost for each order received to at least £1.24.

Additionally, there is the inconvenience for the author, who must buy the materials, save the program several times to ensure a good quality copy, not to mention the time and effort involved in writing the program and article in the first place. For a program as comprehensive as Wordproc, this must have taken quite a while!

If Mr Henderson prefers to type in programs from listings rather than pay £3 for the privilege of having a cassette sent to him, the choice is entirely his.

Objections would be justified if the price being asked was considerably higher, but I for one feel £3 is a small price to pay for typing in 3,000 bytes of hexidecimal numbers.

This is especially true when one considers that similar word processor programs cost rather more than £3, or even £10.

Stephen Williams
Porthcawl
South Wales

NDUG

WITH REFERENCE to the letter from Martin Vernon (Letters Page October 1985). I can't help wondering if Martin has ever bothered to take sufficient time off from all that programming, etc, to attend one of the 6809 Shows or even to read *Dragon User*! . . . If he has, it seems strange that he doesn't know that the National Dragon Users Group has been around since August 1984, and has a very healthy membership list!

Most of his queries have been covered in various issues of the group newsletter "Update", and it's possible that he could have saved himself a lot of work by joining us!

For the benefit of any other Dragon users who may not have noticed us, all you have to do is send a sae to Paul Grade, National Dragon Users Group, 6 Navarino Road, Worthing, Sussex, and we'll send you full details. Membership costs £7.50 per year (£9 outside the UK), and this gets you a monthly newsletter, help with hardware and software problems, advice and help with repairs, and quite a few special offers from various companies.

Paul Grade
Chairman
Worthing
Sussex

Dragon Plus

I HAVE received many letters on enhancements for the Dragon, most of the letters concerned the poor text display on the Dragon, which seems to be the major problem with Dragons both in domestic and other uses. Other people were concerned about the Dragon 32 and its future role.

Our new Dragon plus interface was designed for both 32K and 64K owners and gives the better display quality we all felt was needed. It also allows 32K owners to join the "FLEX set" if they want to, or to add much needed memory to their computers. In addition our new expansion can save the cost of an additional disk unit for disk owners as the extra memory is configured as a very fast RAM Disk when FLEX is used. We are also working on OS9 drives for release soon.

Our approach is to use existing, cheap, technology to give as many owners as possible the opportunity of expanding their computers at a reasonable cost, hence Dragon Plus. Compusense does not own Dragon — some people tend to forget that!

May I thank all the readers who wrote to me. I have not had time to reply to each person but I have read all their comments with great interest.

Ted Opyrchal
Compusense Ltd
London N13

Dragon Beachead

TO DRAGON Computers Ltd. Could you tell me your nearest stockists of games in my area. Plus I have noticed several games like *Combat Lynx, Fighter Ace, Beach Head, Forth Protocol* and *Ghostbusters*.

Do you make any of these games.

Colin Jackson
Carlisle
Cumbria

ACTUALLY, Colin, *Dragon User* has no connection with the people who make the Dragon Micro, nor with any companies which make games for it — we are an independent magazine.

Pokes

REF: Reply to Harry C. Taylor (October 1985 *Dragon User*), the following line can be added to Steve Gathercole's Moon Miner (June 1985 *Dragon User*).

```
165 POKE 30016,18: POKE
30039,19: POKE 30044,25:
POKE 30067,24: POKE
30072,30: POKE 30095,30.
```

This will enable the program to be run with the Dragon DOS plugged in.

Dragon DOS users might be interested to note that this letter was typed using Peter Whittakers word processor (September 1985 *Dragon User*). It is certainly different to any other word processor that I have used and once you've got used to it, it definitely works.

How about listing a few Bulletin Board numbers?

Here are a few 24 hour 300 baud numbers (FREE).

RBBS 0376 518818
GOSPORT 0705 524805
BELTON 0493 781334
TUG 01 200 7577
ESTEC 010 31 1719 84240 (HOLLAND).

Graham Smith
3 Ashton Gate Terrace
Bristol BS3 1TA

Baudwalk

THANK YOU for mentioning my bulletin board in your November issue. There are some things that weren't mentioned that would be useful!

a. The board runs at 300 baud using CCITT tones.

b. Settings needed to access are 7 data bits, even parity and one stop bit.

c. You don't need to have OS9 to access the board — any communications software capable of the above will work.

Finally, another plug for the system: times are Wednesday and Saturday 1900 to 2200 and Sunday 1000 to 2200. The number is 0705 736025.

Jon Dunster
(Sysop BBS09)

Pros & Cons

RE-DRAGON Plus Expansion by Compusense. I am interested in the above expansion for my Dragon 32 and have received some information from Compusense, but before I commit myself to purchase of same, I wondered if you have had a look at it and if you had could you advise me of the pros and cons, as you may appreciate I do not like wasting money.

Mr D. Barber
64 Eden Close
Woodthorpe
York

Read further on for details Mr Barber.

Epsom

THE ARTICLE "Coding The Words" by Peter Whittaker was in my opinion the best ever run in your magazine. However, for those of us with Epsom or Epsom compatible printers, the program needs some alteration:

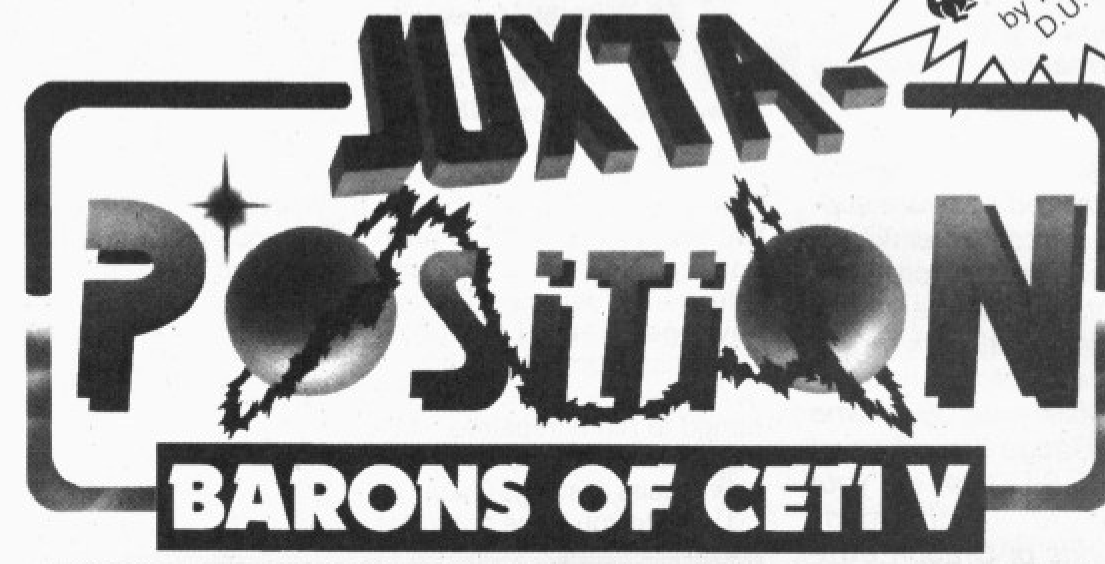
```
POKE &H11E2,17
POKE &H11CB,17
```

This changes the "SO" command which my printer interprets as condensed mode to a more manageable "DC1" command.

Mike Hodges
3 Lilstock Avenue
Ashley Down
Bristol BS7 9LE

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Awarded by Mike Gerrard D.U. Dec '85



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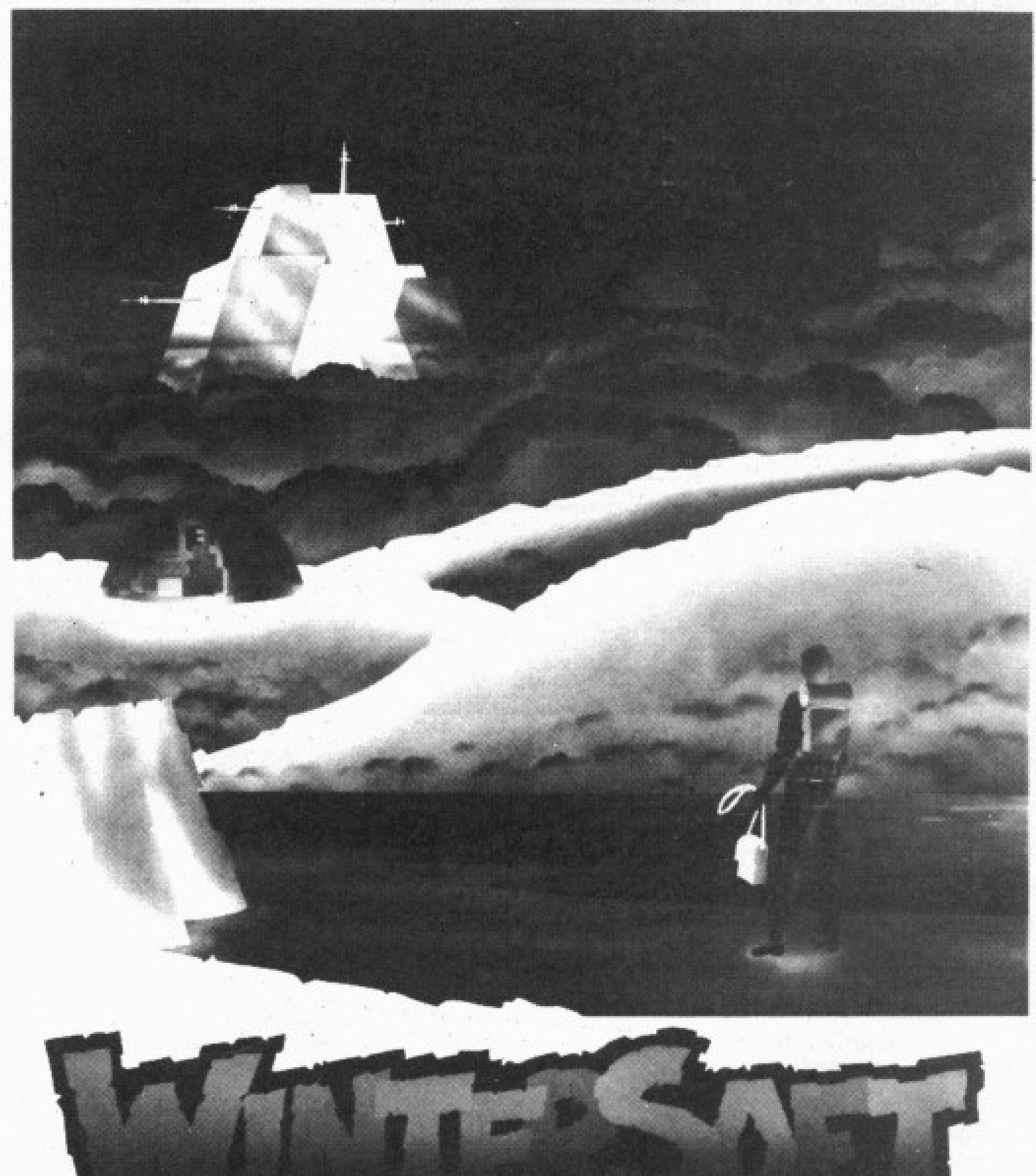
May luck travel your path.

HOW TO ORDER

Don't despair if you are unable to buy our games locally. Our express mail order service will despatch your order within 24 hours of receipt. Fill in the order form on this page (or write us a letter), enclose a cheque or postal order made payable to WINTERSOFT, and post it to:

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EN2 7PT
01-367 5720
(Trade enquiries welcome)



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Communication

Send in you questions, requests, and pleas to Communication, Dragon User, 12-13 Little Newport Street, London WC2

Communication, as defined by the Extremely Small Pocket Oxford Dictionary, is the 'imparting or exchange of information' . . . and this is what 'Communication' in Dragon User will be all about too. As commercial technical and software support for our computer wains, we get ever increasing amounts of mail on a variety of subjects, all asking for help and information — more than our Supremo Brian Cadge could ever handle. So this is your chance to reach many thousands of Dragon owners who might be able to help you — and, of course, if you can help someone — why not drop them a line? Here are the first few problems to kick off — we'll be hoping to pack more in next month. Over to you . . .

Dump

COULD ANY reader supply me with a Basic program to Screen Dump from a Dragon 64 to a Tandy TRS-80 Colour Graphic Printer.

Any costs incurred would be reimbursed.

J W Middlemiss
10 Cleveland Gardens
High Heaton
Newcastle upon Tyne NE7 7QA

Repairs

I HAVE been a Dragon User for two years (Dragon 32). I have now encountered a problem. After perfect service it has now developed a fault. I returned it to Dixons from where it was purchased — it was then returned to me unrepaired, stating that there was no place that now repairs or stocks Dragons.

I write to you in the hope that you could advise me of a repair shop or such in the North-West or in fact anywhere.

M P Finn
7 Windsor Drive
Ellesmere Port
South Wirral L65 6SH

Midi

WANTING TO broaden my Dragon's Horizon in the realms of music creation, I wonder if you could advise me as to whether there is a company that produces a Dragon Midi interface?

Peter Thompson
132 Southview Drive
Westcliff-on-Sea
Essex SS0 9QD

Synth

I AM writing for information on any software or hardware which will produce Drum and Sythesizer sounds for the Dragon 32. I have seen software for the Commodore and Spectrum — also a new hardware machine which produces Drum sounds. I would like to know if anyone has anything like this for the Dragon 32. Can you help?

Christopher Leafe
3 Minster Walk
Hurworth
Darlington
Co Durham D62 2AR

Communication

Stuck for a routine? Need some obscure equipment? Feeling cut off? Fear not — someone, somewhere can help you! Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address and send it to Communication, Dragon User, 12/13 Little Newport Street, London WC2H 7PP. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem...

....

....

Name..

Address...

....

Dragon Plus

*The ultimate expansion for the Dragon? **Roy Cotes** checks it out.*

COMPUSENSE PROUDLY advertise their 'Dragon Plus' board as being the 'Ultimate Expansion For Your Dragon'. This is a very bold statement indeed and so it was with great interest that I prised it from it's wrappings. (Compusense are very, very generous with their sticky tape!).

The expansion unit costs of a single, very professional looking circuit board about six inches square with a short ribbon cable connected to it. The board has been designed to 'piggy-back' onto the Dragon's main circuit board, which is nice because the whole thing fits inside the Dragon's case and so leaves the cartridge connector completely free. Instructions for installing the board may appear a little sparse at first consisting of only a single sheet of paper, but all the necessary information is present and includes diagrams and photographs of the fitted device. Provided that a little care is exercised, the job is quite simple and should create no problems even for the most inexperienced user.

The principal components on the board include 64k of dynamic RAM, a 6845 Video Display Generator (VDG) as used in the BBC micro, an 8k Eprom containing the character set for the VDG, a 2k RAM chip which is used to store the information displayed by the VDG, and after installation, your SAM chip and one of the Dragon's BASIC EPROMS.

There are three steps to installing the board, the first is to bypass a resistor on the Dragon's main PCB, the second is to fit the board itself, and the final step is wiring up the extra monitor socket. Obviously the first thing to do is remove the Dragon's top cover and keyboard assembly to gain access to the main PCB. Once everything is out of the way then the work can begin.

The bypassing of the resistor involves simply soldering a short jumper wire across the legs of the component. This resistor forms part of one of the oscillator circuits within the Dragon and unless the jumper wire is fitted, a screen flicker may become apparent when using the 80 column display.

Installation

The fitting of the board itself is very easy. Firstly the SAM chip must be very carefully removed from its socket and inserted into a new socket provided on the expansion board; this is the part where the care must be exercised as the SAM chip is *VERY* sensitive to handling and *VERY* expensive to replace. The first of the two BASIC Eproms must also be removed from the main PCB and inserted into a socket on the expansion board which now neatly slots into the empty socket on the main PCB which was originally occupied by the SAM chip. Now the Ribbon cable connects to the socket on the main PCB in place of the BASIC Eprom which was removed earlier. It is recommended that a little adhesive is used to secure the board in place and care must be taken to ensure that the underside of the board does not come into contact with any of the components on the main PCB. This is not a problem as it is only a case of bending the odd capacitor so that it lies flat on the board.

Finally the extra monitor socket. A monitor is essential on any machine that uses an eighty column display as an ordinary television set will not display that amount of information clearly enough to be of much use. The obvious choice is to fit a DIN socket to match the monitor socket fitted as standard on the dragon; this will enable existing cables to be used. Wiring the socket up is very easy provided you have access to a soldering iron. Two wires must be taken from the top left hand corner of the expansion board (which is clearly marked) — these are the composite video signal and an earth wire. A third wire is taken from the back of the existing monitor socket to provide the sound output (Fig One).

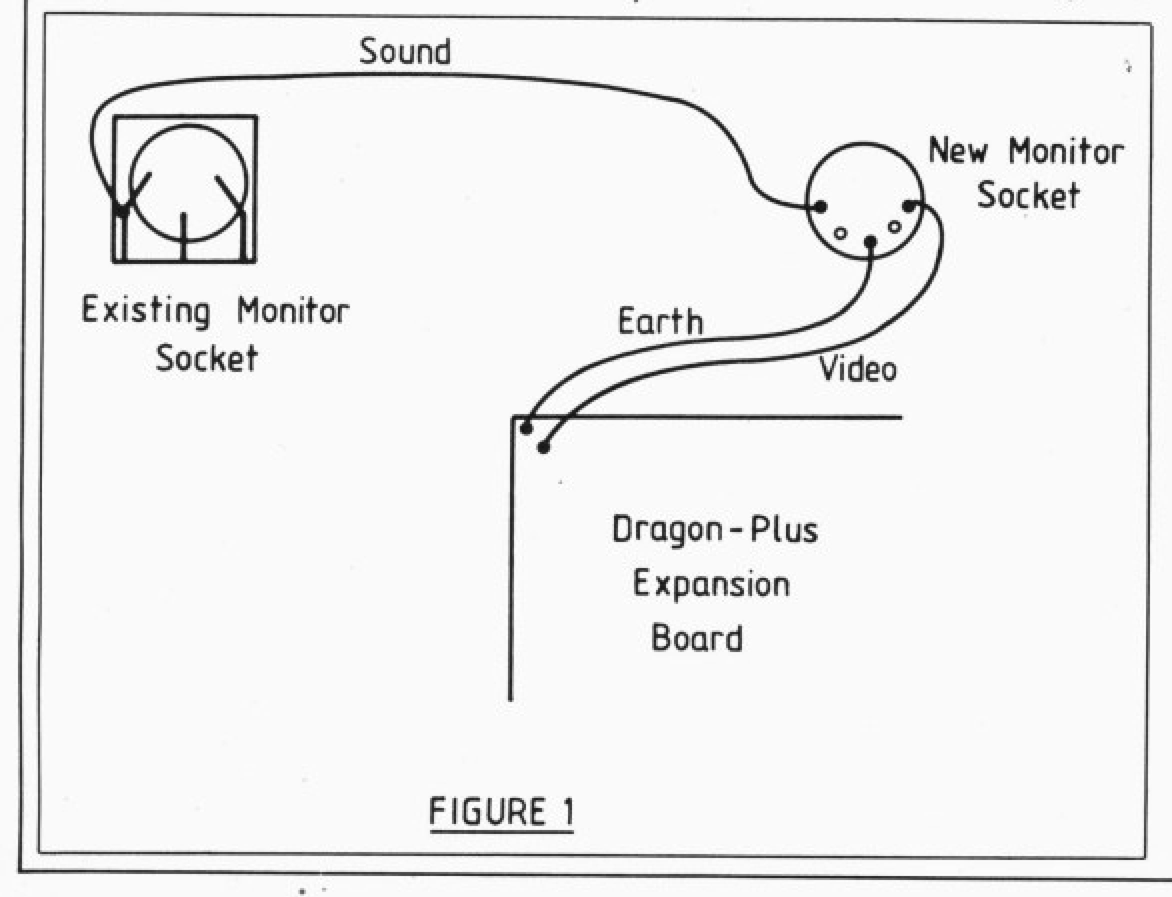
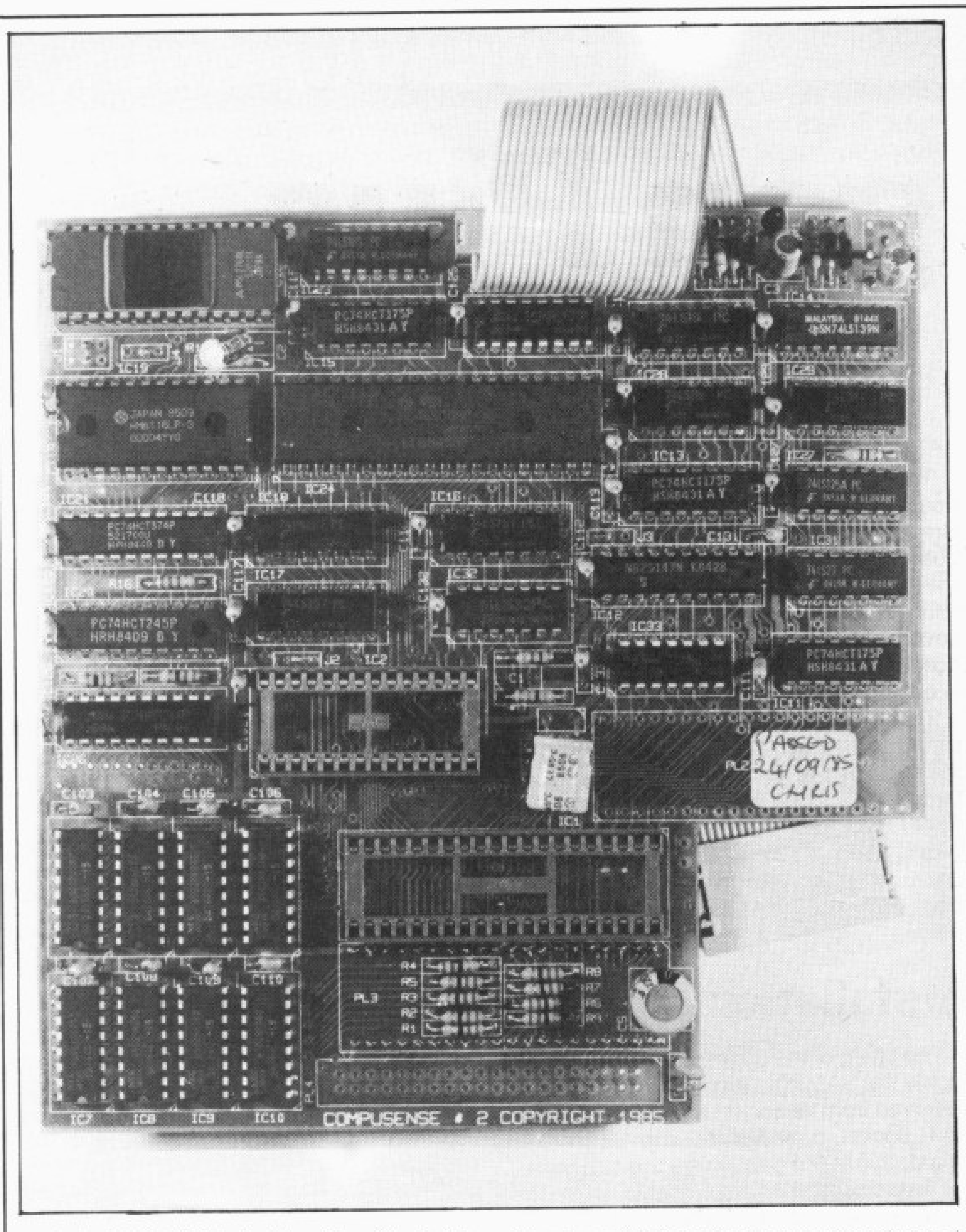


FIGURE 1

Features

So, installing the board is quite easy, but what does it offer? There is the 64K of RAM on the board which may be accessed as two banks of 32K by means of the RAM paging capabilities of the SAM chip. There is a 6845 Video Display General (VDG) which is the same as used in the BBC micro and which will give an 80 column by 24 line display. There is a 2K RAM chip on board which is used by the VDG so that none of the Dragon's RAM is used for display purposes, but the real power of the expansion board is demonstrated when the custom version of Compusense FLEX is booted. FLEX on a standard Dragon is very powerful but in conjunction with this board several new features become apparent. The new FLEX uses the extra 64K of RAM as a silicon, or 'virtual' disk, equivalent in size to 240 floppy disk sectors. This as you can imagine is very quick when compared to an ordinary floppy disk unit as access to data will be very much faster. The only problem is that with the virtual disk being volatile RAB, as soon as the Dragon is



switched 'off' all data held on the virtual disk will be lost. This problem has, to a certain extent, been alleviated by Compusenses recommended use of the virtual disk. The example start up file given on the system disk defines the virtual disk as being the main system disk and then copies the most often used files such as the CAT and LIST utilities from floppy disk to the virtual disk. This means that these commands are executed almost immediately as there is no disk access required to load the command into the utility command space before that command may be executed. An example is the TSC editor which takes 8 seconds to load from floppy disk but only 2 seconds to load from the virtual disk. Although this is only a saving of 6 seconds, a program which requires a lot of disk access (such as the assembler program) took one minute two seconds to assemble a short file using the orignal floppy based system but only 14 seconds using the virtual disk system. This is a saving of 48 seconds. On a larger file the savings will obviously be even greater.

The FLEX system disk supplied is booted under Dragon DOS using the familiar BOOT command. A minor hiccup here is that because the monitor needs to be connected to the new 80 column monitor socket, the BOOT command has to be either typed 'blindly' or the monitor plugged into the standard Dragon monitor socket.

The new version of FLEX allows you to ask a logical number to each device on the system. For example the virtual disk may assigned as device zero and the floppy disks on a multi-drive system may be assigned the numbers one and two. Once the devices have been assigned a number, they may then be assigned a function such as whether they are system or working devices. By assigning the system to be 'all' drives then the virtual disk will be searched first followed by the first of the floppy disk units. This means that the most often called files which have been moved to the virtual disk will be called very quickly whilst the lesser used files will also be loaded from floppy without the user having to specify a drive number.

The virtual disk may be treated in just the same way as an ordinary disk unit using the same standard commands such as CAT and LIST, but an extra command called VINIT has been added to the system disk which will effectively 'format' the virtual disk in the same way as an ordinary disk would be.

The FLEX system disk comes with a customised version of DBASIC which has been updated to work with the 80 column display so that BASIC users will benefit from the Dragon-Plus as well as the dedicated Flex-Fanatic. Most of the commercial software available for FLEX (and OS9) was originally written to be used with an eighty column display so there is no shortage of software available. Some of the packages currently available for the 51 column display, including SP-EDIT and the RMS database system, were tried with the Dragon-plus system and found to work perfectly.

Conclusion

In conclusion, the board is manufactured to a very high standard using high quality components. There were no problems encountered fitting the board to the Dragon. The custom FLEX system worked admirably, and the whole package worked first go. The 80 column display is very, very fast and exceptionally clear. The control codes which set up the various screen features on the 51 columns hi-res display such as windowing, etc, have all been adjusted to work with this new display. The Virtual disk certainly gives the impression that you are using a 'real' system and offers a lot more flexibility than would normally be available. For the single floppy drive owner wishing to move to a twin drive system it may be worth considering a Dragon-Plus instead of buying a second floppy drive. As well as getting the much needed 80 column display, the expansion is cheaper, faster, and quieter than a floppy drive and when the time comes to expand to an even bigger system the Dragon-Plus board already has the connector ready to interface to Compusenses hard disk controller which should be available in time for the November 6809 show.

Compusense are currently perfecting a ROM based version of FLEX which will replace one of the BASIC eproms so that the Dragon will 'power-up' as a Flex system which will support printer spooling (the ability to list files to a printer whilst running other software) and should BASIC be required then DBASIC will still function as normal. Unlike many expansions or other add-ons, you do not lose any software compatability with the Dragon-Plus system. It is still possible to use the Dragon as if no expansion board was fitted.

As for the claim that this is the ultimate expansion for the Dragon, well, at the present time there is nothing that compares with it. Add to this Compusenses future plans and their claim may be a genuine one.

Hardware — *Dragon Plus Expansion*
Price — *£103.50 (plus £1.00 p&p)*
Micro — *Dragon 32 & 64*
Supplier — *Compusense Ltd*
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Advanced Basic

Work and play combined on the Dragon by ***Gareth Fenton***

THE DRAGON has a very powerful Basic but poor documentation, and there are a number of useful routines and commands not covered anywhere. This article demonstrates, with an example game program, some lesser known techniques available to all, whether or not they possess an assembler. The only machine code in this program are ROM routines that can be called from Basic with "EXEC", and the short auto-run routine that works with any Basic program.

The object of the game is to keep your three cities as cities (instead of rubble) for as long as you can. Trying very hard to stop you are the alien bombs that fall vertically from the top to the bottom of the screen, always ending up on a city — unless you destroy them en route.

This is achieved by moving your ship up and down on the left of the screen to be in line with the bomb and pressing the fire button. Easy! By the way, just to ensure that you don't delay, the alien attack ship is constantly manoeuvring for a clear shot at you. If you remain stationary for too long, it will fire. Like the bombs, it never misses. The time delay before it fires, and the time taken for the bombs to fall, decreases at each level. Only certain parts of the bomb (the white parts) mean a hit, so good shooting is needed.

Pause and Return features are written into the game. Simply press either P or R at any time. To restart after Pausing, press any key. Level 6 on the game is a "suicide level" — to see what I mean, select it and try. You will not last long.

The auto-run routine starts at line 3000. Instructions for it are included in that part of the listing. I suggest that you type in GOTO 3000 as a direct command before running to save the program so that it will auto-run. NOTE. Type CLOADM to load the program once saved in this way.

I will now explain how the program works.

Welcome to the world of structured programming! This means that each section of the program has been made into a mini-program or subroutine, each one being called with GOSUB and terminating with a RETURN command. The GOSUBs and the start of each subroutine are labelled with REM statements so that you can easily follow what is going on. Writing your own programs like this is not very hard once you get used to it, and they are much easier to debug than "spaghetti" programs, ie with GOTOs everywhere! They can also be quicker to run. There are a lot of REMs (') in the program — these can be left out if you wish.

Lines 10-180. This is the main control routine — it calls each subroutine. Many of you will be puzzled by lines 120-140 and 170. The variables YOUHIT, THEMHIT and FINISHED are set to −1 inside a subroutine and the DRAGON reads these lines as

IF YOUHIT=−1 THEN . . .

This is because −1 is the code for "true". This is hard to explain so try it yourself with the following:

LET A=5:PRINT A=5

−1 is the answer.

PRINT A=3 returns 0 indicating FALSE.

I have used this method to pass TRUE and FALSE messages between routines as it is easier to follow, looks better and is slightly faster. IF NOT FINISHED in line 170 explains itself.

The same sort of thing is used in the double speed check in line 2240 where DS is either 89 for "Y" to the question in line 1190 or 78 for "N". Try this in your own programs.

Now for the subroutines.

Lines 1000-1140 contain, as I am sure 99 per cent of you know, the text screen pokes. These are from 1024 to 1535 but the character codes are different from their ASCII equivalents. Also some non-ASCII characters are available — such as inverse numbers and space, etc.

Lines 1320-1440 and lines 1470-1630 are both routines for creating User Defined Characters. Doubtless most of you have had to listen to owners of lesser machines such as the Commodore boast of the few sprites available on it. Well, now you can create your own, and, with a little care, animate and control them just as well with GET and PUT plus one of the five options available (AND, NOT, etc). To create your own UDGs use 0 for a black pixel and 1 for a white, make FOR A=1 TO the number of rows, alter the DIMming, GETting and PUTting and run the subroutine.

Line 1800 contains EXEC 34091. This calls a ROM routine that waits until a key is pressed before continuing. Machine code users might like to note that the key pressed is held in the A register. JSR 34091:CMPA #keycode:BEQ . . . can be used to check for a certain key.

Lines 2100-2150 read the joysticks and PUT your fighter. This is done with EXEC &HBD52 which stores the joystick values in locations 346-349. Reading them this way is quicker than using the JOYSTK command. The fire button is checked for using (PEEK (65280) AND 1) as each joystick has two values for the fire button. Using this saves the need for IF PEEK (65280) = 126 OR PEEK (65280) = 254 THEN . . .

This method is shorter, quicker, and allows keyboard control to be more easily augmented by replacing the memory locations used with those given later in the program.

Lines 2290 and 2340-2390 make an effective explosion by drawing concentric circles, gradually getting bigger, first in the foreground colour and then in the background colour to blank it out again. The Dragon's circles miss out some pixels when drawn like this and these pixels make the "debris" left after the explosion.

Lines 2440-2480 are the PAUSE and RETURN features. This routine may be typed into your own programs to add this feature, normally found on professionally written games. The routine must be called once a loop in a program.

Line 2610 caters for answers such as Y, YES, YEAH, etc in answer to a program.

To use the keyboard for control, follow the directions given in lines 2630-2700.

For those who write machine code programs I include, to round it all off, a listing of a basic program that will auto-exec one written in machine code. It has the advantage of being short and easy to use. Also it will exec the program if the RESET button is pressed.

To Auto-EXEC Machine Code programs use

```
10 CLOADM "your program"
20 POKE &H16B,PEEK(157):
   POKE&H16C,PEEK(158)
30 POKE &H16A,&H7E
40 'DESIGN TEXT LOADING SCREEN
50 CSAVEM "your program", &H16A,
   PEEK(126)*256+PEEK(127)-1,0
60 POKE &H16A,&H39:POKE&H16B,
   &H39:POKE &H16C,&H39
```

If you do not wish to CLOADM your program, omit line 10 and replace the PEEK (126)*256+PEEK(127)−1 in line 50 with the last address in your program.

To reload your program type CLOADM and press the enter key. The loading screen that you defined in line 40 will be displayed during loading. Loading takes about two minutes longer than usual but will auto-EXEC on loading and if RESET is pressed. Note that this method only works with machine code programs.

For those who do not feel like typing in the game, a cassette is available for £3.00 (cheque or P.O.) from Gareth Fenton, 206 South Lodge Drive, Southgate, London N14 4XN.

```
10 GOSUB 1000 'TITLE
20 GOSUB 1250 'SETUP
30 GOSUB 1830 'SELECT TARGET
40 FOR MY=0 TO 130 STEP 6-SL
50 PLAY "V31;L8;T175;O4;FGA"
60 GOSUB 2440 'PAUSE AND RETURN
70 GOSUB 2050 'MOVE BOMB
80 GOSUB 2090 'MOVE YOU
90 GOSUB 1970 'MOVE ENEMY FIGHTER
100 GOSUB 2170 'FIRE YOUR LAZER
110 GOSUB 2220 'INCREASE LEVEL
120 IF YOUHIT THEN GOSUB 2270 'EXPLODE
130 IF FINISHED THEN 2510 'END
140 IF THEMHIT THEN 30 'NEW BOMB
150 NEXT MY
160 GOSUB 2330 'EXPLODE BASE
170 IF NOT FINISHED THEN 30
180 GOTO 2510 'END
190 '
200 '
210 '
1000 POKE65494,0
1010 CLS
1020 FOR A=1024 TO 1055:POKEA,42:NEXT
1030 FOR A=1056 TO 1535 STEP 32:POKEA,42:NEXT
1040 FOR A=1087 TO 1535 STEP 32:POKE A,42:NEXT
1050 FOR A=1504 TO 1535:POKEA,42:NEXT
1060 PRINT@34,"*************";
1070 PRINT@66,"*BOMBER*V2.7*";
1080 PRINT@98,"*************";
1090 PRINT@134,"*************";
1100 PRINT@166,"*WRITTEN**BY*";
1110 PRINT@198,"*************";
1120 PRINT@234,"***************";
1130 PRINT@266,"*GARETH*FENTON*";
1140 PRINT@298,"***************";
1150 PRINT@418,"WHICH SKILL LEVEL (1 TO 6)?";:SL$=INKEY$:IFSL$="" THEN1150
1160 SL=VAL(SL$)
1170 IF SL>6 OR SL<1 THEN 1150
1180 SL=6-SL
1190 PRINT@32*13+1,"CAN YOU USE DOUBLE SPEED (Y/N)";
1200 DS=PEEK(135):IF DS<>89 AND DS<>78 THEN 1190
1210 PRINT@449,"*********please**wait*********";
1220 RETURN
1230 '
1240 'variables
1250 DIM US(59)
1260 DIM ES(50)
1270 DIM BS(200)
1280 EF=40
1290 H=1
1300 PMODE4,1:PCLS
1310 '
1320 'define enemy fighter
1330 DATA 000000000001111100000
1340 DATA 000000000011111110000
1350 DATA 000000001111111111100
1360 DATA 000111111111111111110
1370 DATA 111111111111111111111
```

```
1380 FOR A=1 TO 5
1390 READ A$(A)
1400 FOR B=1 TO 21
1410 PSET (B,A+5,VAL(MID$(A$(A),B,1)))
1420 NEXT B,A
1430 GET (0,0)-(21,15),BS
1440 PCLS
1450 '

1460 'define enemy bomb
1470 DATA 00011000
1480 DATA 01011010
1490 DATA 00111100
1500 DATA 11111111
1510 DATA 10011001
1520 DATA 10011001
1530 DATA 01100110
1540 DATA 11100111
1550 DATA 11100111
1560 DATA 11111111
1570 FOR A=1 TO 10
1580 READ A$
1590 FOR B=1 TO LEN(A$)
1600 PSET (9+B,9+A,VAL(MID$(A$,B,1)))
1610 NEXT B
1620 NEXT A
1630 GET (10,0)-(18,20),ES
1640 '

1650 'set up bases
1660 PMODE3,1:PCLS
1670 COLOR2,1
1680 LINE(130,150)-(160,160),PSET,BF
1690 LINE (170,150)-(200,160),PSET,BF
1700 LINE(210,150)-(240,160),PSET,BF
1710 COLOR3,1
1720 LINE(128,160)-(256,192),PSET,BF
1730 '

1740 'define your fighter
1750 PMODE4,1
1760 HU$="R3F5R10E5R7R3FR3FR3FR3FR3GL3GL3GL3GL3L33U7"
1770 DRAW"BM10,10;XHU$;"
1780 PAINT(12,13)
1790 GET (10,0)-(60,30),US
1800 PRINT@449,"*********press*a*key*********";:EXEC34091:SCREEN1,1
1810 RETURN
1820 '

1830 'select target
1840 THEMHIT=0
1850 SF=0
1860 G=RND(3)
1870 ON G GOTO 1880,1900,1920
1880 IF BA(1)=2 THEN 1900
1890 FX=143:G=1:GOTO 1940
1900 IF BA(2)=2 THEN 1920
1910 FX=183:G=2:GOTO 1940
1920 IF BA(3)=2 THEN 1880
1930 FX=223:G=3
1940 MY=0
1950 RETURN
1960 '

1970 'enemy fighter move
1980 IF UX+10<EF+5 THEN EF=EF-5:ST=0
1990 IF UX+10 >EF+5 THEN EF=EF+5:ST=0
2000 PUT(234,EF)-(255,EF+15),BS
2010 IF EF+5=UX+10 THEN ST=ST+1
2020 IF ST>SL THEN YOUHIT=-1
2030 'RETURN
2040 '

2050 'move bomb
2060 PUT (FX,MY)-(FX+7,MY+20),ES
2070 RETURN
2080 '
2090 'move your fighter
2100 EXEC&HBD52
2110 IF PEEK(347)<20 THEN UX=UX-10:IF UX<0 THEN UX=0
2120 IF PEEK(347)>40 THEN UX=UX+10:IF UX>130 THEN UX=130
2130 IF (PEEK(65280)AND1)=0 THEN FB=2
2140 PUT (10,UX)-(60,UX+30),US
2150 RETURN
2160 '

2170 'fire and check for hit
2180 IF FB=2 AND SF<3 THEN LINE(60,UX+15)-(FX,UX+15),PSET:LINE(60,UX+15)-(FX,UX+
15),PRESET:FOR A=1 TO 3:PLAY"T100;L8;O5;EFGAB":NEXT A:SF=SF+1:IF PPOINT(FX,UX+14
)=5 THEN H=H+1:DC=2:LH=LH+1
2190 IF DC=2 THEN DC=0:LINE(FX-8,MY+4)-(FX+4,MY+20),PRESET,BF:PLAY"V31;O4;L8;T12
5;CDEFGABC":THEMHIT=-1
2200 FB=0
2210 '

2220 'level increase
2230 IF LH=10 THEN SOUND 50,5:LH=0:SL=SL-1:IF SL=0 THEN SL=5
2240 IF SL<4 THEN POKE 65495+(DS=78),0
2250 RETURN
2260 '

2270 'your fighter destroyed
2280 YOUHIT=0
2290 LINE(234,EF+9)-(60,UX+15),PSET:FOR A=1 TO 5:PLAY"V31;T75;O5;L8;BAGF":NEXT A
:LINE(234,EF+9)-(60,UX+15),PRESET:FOR A=0 TO 35:CIRCLE(35,UX+15),A,5,0.15:NEXTA:
SD=SD+1:FOR A=0 TO 35:CIRCLE(35,UX+15),A,0,0.15:NEXTA:ST=0:SF=0
2300 IF SD=5 THEN FINISHED=-1
2310 RETURN
2320 '

2330 'base destroyed
2340 FOR A=1 TO 20
2350 CIRCLE(FX,150),A
2360 NEXT A
2370 FOR A=1 TO 20
2380 CIRCLE(FX,150),A,0
2390 NEXT A
2400 BA(G)=2
2410 BH=BH+1:IF BH=3 THEN FINISHED=-1
2420 RETURN
2430 '
2440 'pause and return
2450 PR=PEEK(135)
2460 IF PR=80 THEN EXEC34091
2470 IF PR=82 THEN RUN
2480 POKE135,0
2490 RETURN
2500 '

2510 'game over
2520 FOR A=250 TO 1 STEP-5
2530 SOUND A,1
2540 NEXT A
2550 SOUND 1,5
2560 CLS:PRINT@10,"BAD  LUCK"
2570 PRINT:PRINT"             LEVEL";6-SL
2580 PRINT:PRINT"    YOU LOST";SD;"OF YOUR SHIPS": PRINT"  AND YOU LOST";BH;"OF
YOUR BASES"
2590 PRINT:PRINT:PRINT:PRINT"   AND YOU STOPPED";H-1;"BOMBS"
2600 PRINT:PRINT:PRINT:INPUT"ANOTHER GO";A$
2610 IF LEFT$(A$,1)="Y" THEN RUN ELSE POKE65494,0
2620 '

2630 ' KEYBOARD OPTION
2640 '
2650 'FOR KEYBOARD CONTROL (UP, DOWN AND SPACEBAR) ALTER PROGRAM AS FOLLOWS:-
2660 'DEL 2100
2670 '2110 IF PEEK (341)=223 THEN ....
2680 '2120 IF PEEK (342)=223 THEN ....
2690 '2130 IF PEEK (345)=223 AND  ....
2700 END
2710 '

2720 '
3000 'BASIC PROGRAM AUTO-RUN
3010 A$="8639B7016A9E7E301F9F1BBD841FBD83ED7EB49F39"
3020 B=999
3030 FOR A=1 TO 43 STEP 2
3040 B=B+1
3050 POKEB,VAL("&H"+MID$(A$,A,2))
3060 NEXT A
3070 POKE&H16B,3
3080 POKE&H16C,&HEB
3090 CLS:PRINT"F AUTO-RUN"
3100 POKE&H16A,&H7E
3110 CSAVEM"AUTO-RUN",&H16A,PEEK(27)*256+PEEK(28),0
3120 POKE&H16A,&H39
3130 END
```

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The Joyful Dragon

The mysteries of joystick operation explained by **Pam D'Arcy**

A JOYSTICK provides two values for a Dragon programmer to use in whatever manner he or she chooses. There is a value relating to a horizontal, or X axis and one relating to a vertical, or Y axis. Both values are in the range 0-63. If like me you have an old Dragon manual, ignore the JOYSTK information and digest the following.

The Joystick values are placed by the BASIC interpreter in four of its workspace locations. Use of the JOYSTK function copies the appropriate value from BASIC workspace into your variable, see Table One.

There is a routine in ROM (at address $8012) that updates these locations. It is only entered from a BASIC program when JOYSTK(0) (or EXEC &H8012) is used. This applies even if you are only using the left joystick or you are only interested in vertical axes. It is rather like the keyboard and its roll-over allowance — if the joystick readings were updated on every JOYSTK command (or even more frequently), the action may never be frozen for long enough to determine the meaning of the joystick movement to your program.

TYPES OF JOYSTICK

ANALOGUE OR ROLLER-BALL OR TRACKER-BALL are the ones able to give you, theoretically, all possible values, 0-63, in both directions. I say theoretically because, says my more scientific husband, the guts of a joystick are Potentiometers and they may vary slightly even between joysticks produced by one manufacturer, perhaps not being able to send the full range of signals to the Dragon. Basically, wherever you have your joystick physically pointed to, the JOYSTK(0) command will update the locations for both joystick ports (although the values will be meaningless where no joystick is plugged in). Some advertisements may include the words 'Linear Potentiometer'. This is the basis on which one would expect analogue joysticks to work — that movement of the joystick in a line gives regular increments/decrements in the values as the stick progresses along that axis. One would expect the following readings (Table Two) from an analogue or ball-type joystick (the latter type having a large sort of ball-bearing in a socket that you roll around with the palm of your hand **SWITCHED JOYSTICKS** determine readings by a number of 'switches' contained within them, activated by moving a stick. The number of obtainable values is determined by the number of switches alone, often eight plus centre.

As an aside, how about a 16 position box of buttons connected through the joystick port that, with a small handler program, we could use as a hex pad for fast and simple input of hex data?

SELF-CENTERING JOYSTICKS have no effect on readings apart from giving the user a guaranteed (one hopes!) return to the centre point (32,32) on releasing the stick, as it springs back to its 'home' position.

USING JOYSTICKS IN PROGRAMS

The use that you put the readings to is entirely a matter for you. I recall that in a previous *Dragon User* article someone suggested that, unfortunately, a lot of the sensitivity of joysticks is programmed out of them. Using hubby's-built analogue, non-self centering joysticks, I find that the required control can be too sensitive, particularly where a return to centre is demanded before allowing a change of direction in screen-portrayed movement. This can be tricky to achieve, particularly by the young ones in so-called 'educational programs' — mine often give up in dusgust because they cannot understand the mechanics as they move the stick in the right direction — but the program doesn't respond. I feel that less sensitivity about the centre point could be a distinctive plus in such software! I hope you now realise why sometimes advertisements for switched joysticks state that they 'work with most games' — if a game is dependent upon a value/set of values that cannot be returned . . .

JOYSTICK DEMONSTRATION PROGRAM

I knocked up this program really as a quick demonstration of using joysticks in machine code. However, it has proved to be an invaluable quality tester of our joysticks — revealing a weakness along three particular axes that we hadn't previously realised, which is why I suddenly realised that it could be invaluable to you to take it with you to check out potential joystick purchases! The kids have played with it for hours (mainly trying to paint the entire screen blue — quite a feat in joystick control — good job the joysticks are as tough as the kids!).

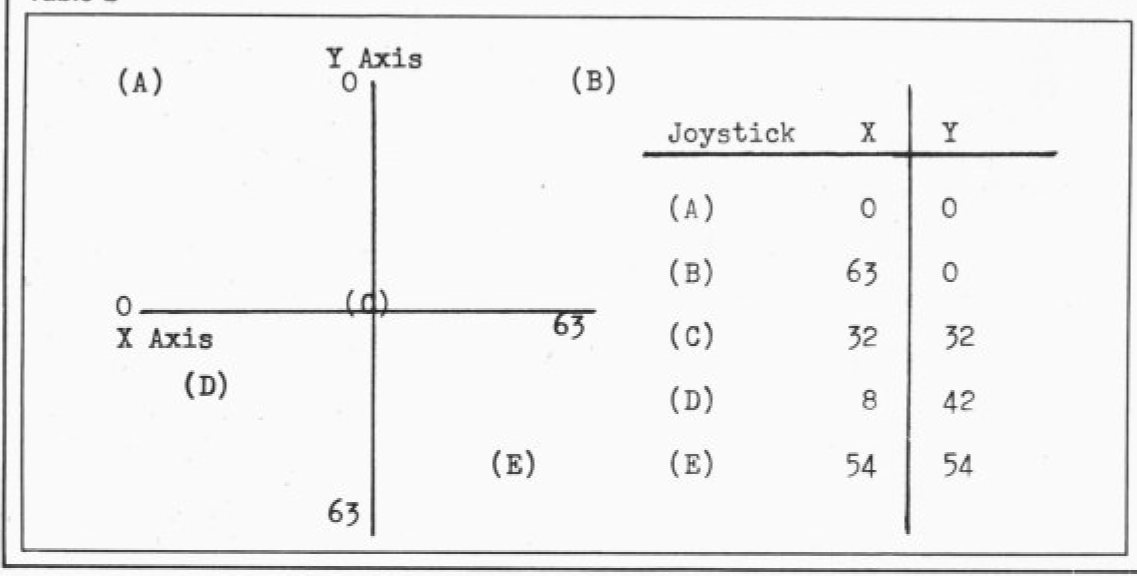
What it does is to relate each reading that it gets back for the right-hand joystick to the graphics screen. As discussed above, analogue joystick readings are 0-63 in both directions.

The screen is 256 pixel columns horizontally by 192 pixel rows vertically. If each possible analogue joystick reading colours a block of pixels to eventually fill the screen, each possible different reading represents a four (256/64) column by three

Table 1

	Dec.	&H	$
JOYSTK(0) Right joystick horizontal	346	15A	15A
JOYSTK(1) Right joystick vertical	347	15B	15B
JOYSTK(2) Left joystick horizontal	348	15C	15C
JOYSTK(3) Left joystick vertical	349	15D	15D

Table 2



Joystick	X	Y
(A)	0	0
(B)	63	0
(C)	32	32
(D)	8	42
(E)	54	54

(192/64) row block of pixels on the screen which is then coloured blue. The machine code part of the program loops round updating the readings (JSR $8012), tracking the movement of the right-hand joystick on the screen, until the FIRE button is pressed. It then exits back to the BASIC part of the program and the graphics screen sits there until S (Start) or Q (Quit) is pressed.

If using switched type joysticks, only the blobs for the available number of different readings-switch positions plus centre will be given. (It thus tells you the number of switchable positions available in the joystick if it is not stated on the pack).

The BASIC program (Listing 1 — JOYSTICK) is pretty self-explanatory. When RUN, after setting up the machine code routine, the PMODE3 screen is cleared to green awaiting a keypress. When S is pressed, it clears to yellow and enters the machine code. The machine code traces the path of the joystick in blue until the FIRE button is pressed.

If you don't yet have joysticks, RUN the program to ensure that it has been typed in OK. 'S' displays a yellow screen containing a small blue trail (whatever values have been deigned to have been given to you in the absence of joysticks until the readings settle). Press RESET to exit from the program.

THE FIRE BUTTON. The location as mentioned in the Dragon manual is the one used to detect fire button presses (65280, &HFF00; $FF00). Only one bit out of the eight bits of a byte is actually used for each joystick and a better (much faster) way of detecting a press than the method in the manual is to use Smeed and Somerville's technique in *Inside the Dragon.* The bit being checked is zero if the button *is* pressed.

FIRER = PEEK (65280) AND 1
FIREL = PEEK (65280) AND 2

The AND 1,2 is isolating the appropriate bit of the byte. If either or both resulting values are zero, that particular joystick (or both) has the fire button pressed. If you can get into the HEX HABIT, PEEK(&HFF00) rather than the decimal PEEK(65280) is a substantial timesaver in BASIC.

The Dragon actually uses one of the keyboard scanning locations to store the fire button information in, so keyboard plus joystick control has to be carefully planned to avoid conflict.

For those wishing to peruse the source of the machine code routine without having to disassemble, I have enclosed the DSKDREAM (available from Grosvenor Software) assembler listing (Listing 2 — JOYWRITE). The JOYWRITE source was entered after a CLEAR200,&H5000.

The demonstration program takes into account the differing graphics page RAM start addresses for disk and cassette systems by loading the last PMODE's page RAM address (default prior to a PMODE command = PAGE1) from the appropriate BASIC workspace variable, $BA,$BB.

I wish you joy with your joysticks.

Listing 1

```
10 REM JOYSTICK PROGRAM (C) PAM D'ARCY
20 CLEAR200,32000
30 CLS:PRINT"LOADING MACHINE CODE"
40 FOR MC=32000 TO 32082
50 READ D$
60 CSUM=CSUM+VAL("&H"+D$)
70 POKE MC,VAL("&H"+D$)
80 NEXT MC
90 IF CSUM<>9527 THEN PRINT"ERROR IN DATA STATEMENTS":END
100 DATA 34,76,BD,80,12,10,9E,BA
110 DATA B6,01,5B,BB,01,5B,BB,01
120 DATA 5B,C6,20,3D,31,AB,B6,01
130 DATA 5A,44,31,A6,C6,F0,86,01
140 DATA B4,01,5A,27,02,C6,0F,1F
150 DATA 98,C4,AA,34,04,43,1F,89
160 DATA A4,A4,AA,E4,A7,A4,1F,98
170 DATA A4,A8,20,AA,E4,A7,A8,20
180 DATA 1F,98,A4,A8,40,AA,E0,A7
190 DATA A8,40,86,01,B4,FF,00,26,B1,35,F6
200 PCLEAR4
210 MCODE=32000
220 PMODE3,1
230 PCLS1
240 SCREEN1,0
250 K$=INKEY$:IF K$="" THEN 250
260 IF K$="S" THEN PCLS2:EXEC MCODE:GOTO250
270 IF K$<>"Q" THEN 250
280 CLS:END
```

Listing 2

```
5001
7D00  7D00             ORG    32000
7D00                   PUT    $5001
7D00
7D00  8012    JOYSTK   EQU    $8012
7D00  015A    JOYRX    EQU    $15A
7D00  015B    JOYRY    EQU    $15B
7D00  FF00    FIREB    EQU    $FF00
7D00  00AA    COLOUR   EQU    $AA
7D00  00BA    GPAGAD   EQU    $BA
7D00
7D00 3476     JOY      PSHS   D,X,Y,U
7D02
7D02 BD8012   JOYA     JSR    JOYSTK
7D05 109EBA            LDY    GPAGAD
7D08 B6015B            LDA    JOYRY
7D0B BB015B            ADDA   JOYRY
7D0E BB015B            ADDA   JOYRY
7D11 C620              LDB    #32
7D13 3D                MUL
7D14 31AB              LEAY   D,Y
7D16 B6015A            LDA    JOYRX
7D19 44                LSRA
7D1A 31A6              LEAY   A,Y
7D1C C6F0              LDB    #$F0
7D1E 8601              LDA    #$01
7D20 B4015A            ANDA   JOYRX
7D23 2702              BEQ    JOYB
7D25 C60F              LDB    #$0F
7D27 1F98     JOYB     TFR    B,A
7D29 C4AA              ANDB   #COLOUR
7D2B 3404              PSHS   B
7D2D 43                COMA
7D2E 1F89              TFR    A,B
7D30 A4A4              ANDA   0,Y
7D32 AAE4              ORA    0,S
7D34 A7A4              STA    0,Y
7D36 1F98              TFR    B,A
7D38 A4A820            ANDA   32,Y
7D3B AAE4              ORA    0,S
7D3D A7A820            STA    32,Y
7D40 1F98              TFR    B,A
7D42 A4A840            ANDA   64,Y
7D45 AAE0              ORA    0,S+
7D47 A7A840            STA    64,Y
7D4A 8601              LDA    #$01
7D4C B4FF00            ANDA   FIREB
7D4F 26B1              BNE    JOYA
7D51
7D51 35F6              PULS   D,X,Y,U,PC
7D53
```

Dragon Logic

True or False — Logic on the Dragon explained by **John Boyes**

THE WAY in which the Dragon's Basic interpreter deals with comparisons as part of IF statements is very interesting and, more importantly, can help the programmer open up some novel programming techniques. Most Dragon users will be aware of the logical operators AND and OR when applied to compound *IF* statements, eg
IF A = 1 AND B = 0 OR C = 0 THEN . . <action> . .
but very few will be aware that these logical operators can also be used in a similar way to + − ☆ and /.

To understand how this is done and what the significance of it is, we must first explore the way in which the Dragon deals with such entities as *TRUE* or *FALSE*.

In the above example the Dragon would first look at the expression A = 1 and decide, from the current value of A, whether in fact the expression is *TRUE* or *FALSE* (ie whether A is indeed equal to ONE or not). If *TRUE*, the expression is given the value −1 and if *FALSE* it is given the value 0.

The reason that −1 is used to denote *TRUE* is that it represents every binary bit set in the integer that represents the logic value.

For example, if two bytes were used to represent an integer value then the highest value it could attain would be &HFFFF.

Now, as numbers are represented in two's complement arithmetic, the most significant bit is treated as a sign bit, a binary 0 indicating a positive number and a binary 1 indicating a negative number. If we were to add one to &HFFFF we would obtain the result &H0000 because the 1 would be carried right through to bit 17. In view of the fact that we are dealing with 16-bit numbers, this 1 will roll off the end into the carry register leaving us with the result zero. Therefore &HFFFF represents one less than zero which is −1.

Getting back to our example, the second thing the Dragon would evaluate is the truth or otherwise of the expression B = 0. The next step would be to *AND* the two logical results of the expressions. To do this the Dragon looks at each bit of one result and compares it with the corresponding bit of the other and if both bits are set it returns the corresponding bit set in the final result word. This means that if both results were *TRUE*, ie −1, the *AND* of the two results would also be *TRUE* but if either were *FALSE* then the final result would also be *FALSE*. The next step would be to evaluate the expression C = 0 as *TRUE* (−1) or *FALSE* (0) and OR the result with the value already obtained from A = 1 AND B = 0. The OR operation is accomplished by comparing each bit of the two logical values but, unlike the *AND*, a one bit is returned if the appropriate bit in either word is set to one.

Having done all this the Dragon is left with a logical result which is either *TRUE* (−1) or *FALSE* (0) and on this basis it knows whether or not to carry out the *action* part of the IF statement. In actual fact the expression in an *IF* statement can be a single variable and the "expression" will be considered to be *TRUE* if the value of that variable is NOT zero. So, for example, the statement;
IF X THEN PRINT "The statement is true."
is perfectly acceptable to Dragon Basic and will cause the string to be printed for every case of X except when X = 0. This principal is particularly useful for checking joystick fire buttons as follows;
IF NOT PEEK (65280) AND 1 THEN PRINT "R PRESSED"
IF NOT PEEK (65280) AND 2 THEN PRINT "L PRESSED"
The advantage of this method is that it automatically accounts for whether the value of the PEEK has the most significant bit set or not and is thus much neater to program than the method given in the Dragon manual.

In the above example the Dragon performed an *AND* between the result of peeking location 65280 and the number 1 or 2 as appropriate. This means that it can do the same thing with ordinary numbers as it did with the values given to *TRUE* (−1) and *FALSE* (0). For example if we entered PRINT 3 AND 5 the answer returned would be 1. To understand how this works the numbers should be converted to their binary form so 3 would become 0011 and 5 would become 0101 when expressed as 4-bit words or "nibbles." If we look at these two binary numbers we note that the only bit which is set in both is the least significant bit which represents the value 1 and hence this is the value returned for the expression 3 AND 5. If we took the same numbers as above and applied the *OR* operator we would obtain the answer 7 or 0111 because each bit is set if either or both of the corresponding bits in the two given numbers are set.

Logical operations as shown above are limited to integers (whole numbers) in the range +32,767 to −32,768. The reason for this is that the Dragon can only preform logic operations on integers up to sixteen bits (two bytes) long and even then it considers the most significant bit to be the sign bit. The significance of this is perhaps best explained by considering the *NOT* operator. The *NOT* operator returns the value which is given by changing all the ones for zeros and all the zeros for ones, this is also referred to as taking the complement of the number. For example *TRUE* is represented by −1 or, in binary 1111111111111111, If we *NOT* −1 we change all the ones for zeros and the result would become zero which we know represents *FALSE*. This is of course what we would have expected because *NOT TRUE* must mean *FALSE*.

Life gets a little more complicated when we ask the Dragon to work out *NOT* 5. As we saw earlier, in 4-bit binary 5 would be 0101. When we take the complement of this number and replace the ones with zeros and the zeros by ones we get 1010. In practice this is just the least significant part of a sixteen-bit word and when we invert it all of the most significant bits become set to one. If we were to add 6 or binary 0110 to this result we would obtain the answer zero with a one carried right through to the 17th bit and hence ignored. The result we obtained for *NOT* 5 therefore was six less than zero or −6. Thus the effect of the *NOT* function on a decimal number is to change the sign of that number and subtact one from it.

There is another logical operator, the *XDR* or exclusive *OR*, (sometimes written *EOR*) but this is not directly implemented on the Dragon. To understand what it is we need to look at the truth tables of *AND, OR* and *XOR* for two variables A and B. (Note that truth tables use a 1 to represent *TRUE*, not −1 like the Dragon).

A	B	AND	A	B	OR	A	B	XDR
0	0	0	0	0	0	0	0	0
0	1	0	0	1	1	0	1	1
1	0	0	1	0	1	1	0	1
1	1	1	1	1	1	1	1	0

From the truth tables it will be seen that the *OR* function includes the *AND* function by default when A and B are both ones, but the exclusive *OR* is a special case of the *OR* function which excludes the implied *AND*. As an example take 3 *XOR* 5. As binary nibbles these numbers are; 0011 and 0101 and the normal *OR* operator would result in 0111 or 7. Note, however, that the least significant bit in both numbers is set to one so, because this condition would also satisfy the *AND* operator, it is excluded and the result become 0110 or 6. One way to obtain the *XDR* operator on the Dragon is to use an expression like;
(A OR B) AND NOT (A AND B).
This is a bit cumbersome so in practice one would use;
(A OR B) − (A AND B).
If the *OR* is *TRUE* and the *AND* is *FALSE* then the result would be −1 minus 0, which is −1 or *TRUE* as we would expect, but if the *AND* is also *TRUE* we would get a −1 minus −1 which evaluates to zero or in logic *FALSE*.

The situation where the *DR* is *FALSE* and the *AND* is *TRUE* is logically impossible — think about it! Thus the minus sign is a useful shorthand way to obtain the logical expression *AND NOT*.

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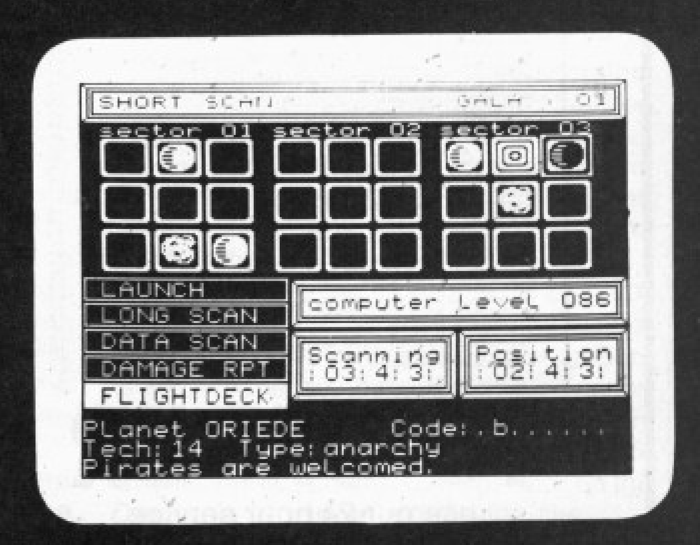
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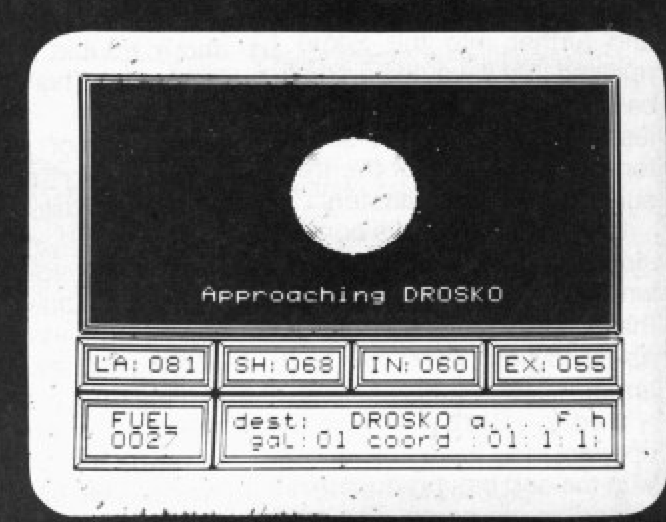
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Magic Mazes

Program: *The Sword and the Sorcerer,* Blaby Software, Crossways House, Lutterworth Road, Blaby, Leicester. **Price** £3.99

WHEN a few years ago I started playing *Dungeons and Dragons* I was sure that it was an experience that would make a great computer game. But as I progressed further and further into the game I realised that it would be practically impossible to write unless it was reduced to simple terms, such as collct the treasure, and kill the monsters.

Having reached this conclusion I dropped all desire to write such a game as I thought that it would have very little ability to hold the player's interest.

Sadly, Blaby Software appears to have disagreed with me and has produced this rather simple game. The idea of the game is to wander around the maze (255 locations), collecting the three pieces of the key and then finding the locked door and escaping. To hinder your progression in this cause there are a seemingly unending string of monsters waiting in the various rooms.

The screen display is in mode 4 screen 1, and is very well done. A small frame to the left of the screen shows the view ahead of you complete with monsters, weapons, and whatever else happens to be in the room (ie food).

Two smaller frames to the right show your attack and defence weapons as icons and beneath these frames there is a list of the available options (the game is played entirely by single key choice from lists — good news for those who hate working out the appropriate words in an adventure). A very terse description of the monster in the room (such as There is a Unicorn here) is printed underneath the main frame (no pun intended) together with reports of your strength when appropriate and other lists of options.

Movement is via the arrow keys and leaves the display very confused as, if the left arrow is pressed, the player will turn to the left and then move one space, but, if there is no door on the left wall, the player will neither move nor turn. Get it? As you can imagine this makes mapping a necessity, but also, as a side effect, extremely difficult.

As you start at a different point in the maze every game using old maps becomes more trouble than making a new one! This is all very tiresome.

The major fault with the game though is that it is very boring. There is no real strategy and, most importantly, no option to "be ingenious" — surely one of the most satisfying parts of playing role playing games.

This program bears an astounding similarity to *Star Swoop:* it's pretty and well-written but has no sustained challenge. However, as an introduction to *D & D* for the masochist, it may fill a gap!

Jason Orbaum



In the dark

Software: *The Dark Pit,* Microdeal, 41 Truro Road, St Austell, Cornwall
Price: £8.00

A CONVERSION from the Tandy, *The Dark Pit* will in fact work with the Tandy Electronic book plugged into the left joystick port, should you have such an item. Failing that, a common or garden joystick will suffice. The game itself is on the fairly familiar maze-like lines of *Touchstone* or Microdeal's QL and Commodore game, *Lands of Havoc.*

It will come as a surprise to no-one that the aim of the game is to escape from the dark pit itself, this comprising a number of linked rooms, each one taking up about three quarters of the screen area, with exits round the borders to other rooms. The joystick controls the inevitable little man, who runs quite gamely around, dodging the equally inevitable monsters and collecting anything he can lay his hands on. These objects are shown at the foot of the screen, and can be brought into play by pressing the 1-6 keys, the items being the likes of shotgun, shield etc., and there are also power packs to operate these.

Also lying around are red, yellow and blue keys, and astonishingly enough these open doors of a matching colour, giving you access to new areas of the maze, and as you collect objects, naturally your score increases. There are several keys of each colour, and you can accumulate these and use them one at a time as required.

Playing the game involves moving the man round the walls and barriers on each screen, avoiding the patrolling monsters and trying to reach as many of the assorted goodies as you can.

Most of the monsters move in regular patterns, and so there's plenty of bobbing and weaving and watching goes on, but there's also an element of *Manic Miner* type strategy in working out how you reach the objects and exits. Other monsters will insist on messing things up by sensing your presence, though.

As such the game is smoothly done and is quite fun to play, but it's rather old hat and merely combines elements of other games we've all seen before, going back to *Berzerk.*

It also has to be said that the collision detection is appalling, and it's far too easy to lose a life with space between you and a monster.

The screens get tougher as you go, with plenty of variety in them, so if you buy it you'll probably get your money's worth playing it, but it's nothing to get wildly excited about.

Mike Gerrard



Music Micro!

Program: Music Master, Golden Key Software, Industrial Estate, Dunkeswell, Devon. **Price:** £8.95 (tape), £9.95 (disk).

MUSIC MASTER is a utility designed to help you write and edit a tune displayed in hi-res in standard musical notation. All options are selected from the keyboard, and as there are 34 possible functions, things are rather confusing to start off with.

This is not helped by the manual which contains numerous printing errors in the table that tells you which keys to press to play each tone.

After a little experimentation, the key layout becomes familiar, and entering a tune becomes a lot easier. It is then that the shortcomings of the program are revealed.

For a start, the program uses the play command and so only one note can be played at a time. This seriously limits the usefulness of the program — it does not have much educational value, and frankly it does not expand the Dragon's music potential at all for the programmer.

For the musician, several things about this program make it irritating to use.

Firstly, no sharps of flats symbols that raise or lower the pitch of a note) are displayed on the stave; bar lines cannot be displayed, and there is no facility to dump the music to a printer — a feature that might have made this program worthwhile.

To give the author his due, the program is very professional, and it does everything the manual says it does, but it is a pity that a little more thought had not gone into the program at the design stage.

David Rowntree





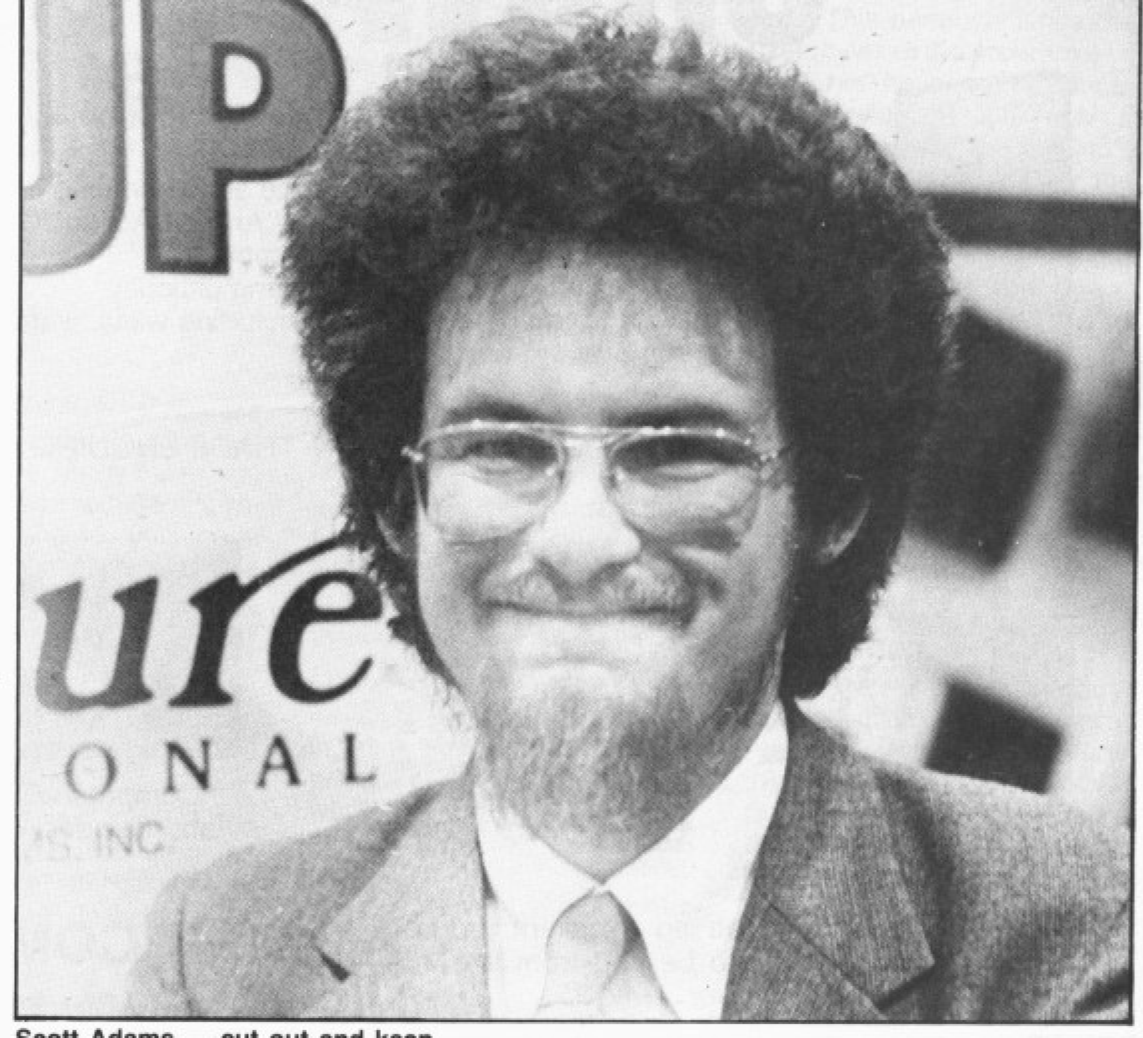
WHERE WOULD we be without Scott Adams? In looking at his series of adventures, all converted for the Dragon fairly recently, I've still only reached *Secret Mission*, which dates from 1979 and is said to be of an advanced level of difficulty, though I wouldn't let that put anyone off. The messy opening screen *is* enough to put you off before you've started, though, and I wish someone could have at least taken a little trouble to tidy it up. It reads as follows: "I am in a b riefing room. Visible items: large tape recorder. Some obvious exits are: west. Welcome to Adventure Number 3 *Secret Mission* by Scott Adams. Dedicated to Maegen Adams. A minute ago someone ran out of this room! By the way, I seem to be carrying something! What shall I do?" My answer is that you put the title and dedication at the beginning, not half-way through your first location, and it might also help if the cassette cover agreed this was adventure number three instead of calling it number four. Nit-picking? Well, if a reader sent me in an adventure for evaluation and it looked like this I'd tell them to sort it out, so I don't see why Scott Adams should get away with it!

Initially there's not much of a story to go on, but if you listen to the tape recorders you learn that you're in a nuclear reactor plant and that a saboteur is at loose. Armed with a time-bomb, the saboteur is prepared to kill himself in order to destroy the plant, and guess whose job it is to stop him? Got it in one. Amazing the messages that get left on tape recorders, isn't it? You're also told that you'll find security keys and a map in the manila envelope beside the tape recorder, but after a frustrating time typing *GET ENVELOPE, GET MANILA, GET MANILA ENVELOPE, MOVE RECORDER etc, I* eventually realised that the envelope must have been nicked by the figure that ran out of the room a minute ago. In which case why didn't he take the incriminating tape recorder, too, which he does later on if you leave it lying around? Perhaps you disturbed him in time, so we'll give him the benefit of the doubt on this one, but credibility is not this adventure's strongest point. Considering that you're trying to save the plant from destruction, it's amazing how hard everyone there makes this for you.

Still, ours is not to reason why, the adventurer must do or die, and you're helped to do it by having a surgically implanted bomb detector on you (or in you) which thankfully is currently glowing green, informing you that the bomb is safe. A little exploration leads to a few twisting corridors and locked doors, with nothing much lying around except for an empty plastic pail in a maintenance room. This object pales into insignificance, however, when you reach the grey room and discover a box with apparatus pointed at a chair which is bolted to the floor. You're told that it seems quite safe and you're invited to sit down. No thank you! Well, not straight away, though you pretty soon discover that in fact this is your only option (unless you can come up with a more imaginative use of a bucket than I could).

I won't tell you what happens in the chair, though I will tell you that there seemed to be a slight bug in the program which wouldn't let me enter any commands once I stood up again, only coming back each time with the response "Use no more than two words." I couldn't even *QUIT*, but this didn't happen a second time so maybe it was just a glitch.

After a while you hear a thud somewhere in the building, and as you rush to investigate you fall over one dead saboteur. He's positively overflowing with objects, like a piece of yarn, an empty envelope, an empty pill case and more, and as well as getting all these you can even get the dead saboteur. Wandering round with a dead body hanging round your neck, you should be able to get through the white door into a large white visitor's room, and while I don't want to give too much away I find the next little hurdle an even more improbable part of the story. The saboteur had an identity card on him, which has to be inspected, but without the body you won't be able to proceed as the picture on the card doesn't match your own face. However, it you happen to have with you the dead saboteur then everyuthing's fine, as the face on the card matches the face on the dead body. Charming! Mind you, if the picture on the card is anything like most passport photos, the only face it would resemble is a dead one.

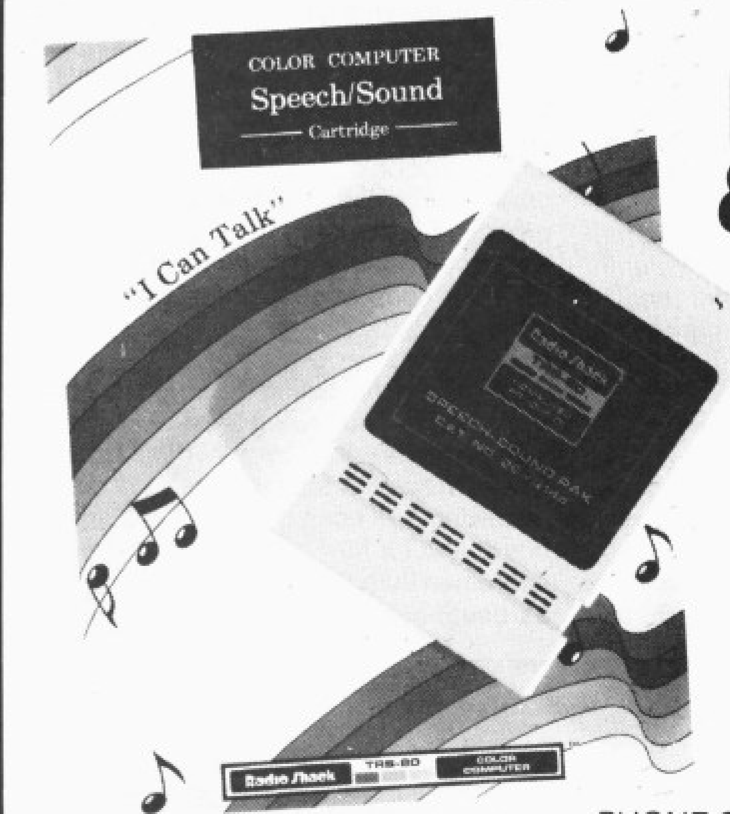


Scott Adams — cut out and keep.

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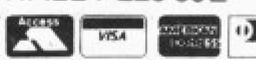
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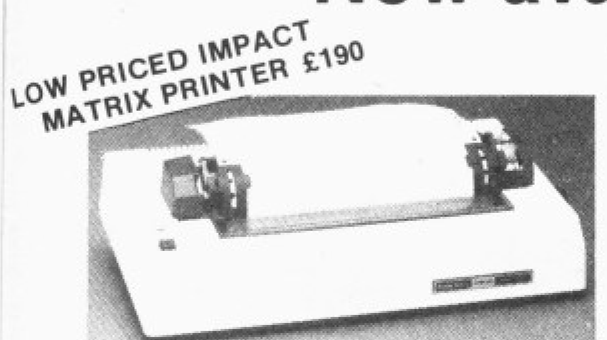
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From here the adventure hinges on getting a correct sequence of events, and also working out the order in which you must press various coloured buttons in order to make things happen or stop them happening. From what I've seen so far, I wouldn't have thought this was notably harder than others in the series, where you sometimes even have difficulty starting, but maybe it gets tougher. Certainly worth investigating, anyway, but I'd try other Adams aventures first.

One of his other titles, of course, is *The Hulk*, and regular reader Philip Blazdell of 93 Jail Lane, Biggin Hill, Kent TN16 3SE is merrily collecting stars in this one but doesn't know where to store them. For that you: *EMREP TSAC*. Philip also says he can't throw bricks high enough to reach . . . something which I couldn't make out in his letter. If you can guess what it is and can help then contact Philip, who in return offers help on most of the Adventure International series.

No doubt the ears of many readers will prick up when they hear that help is available on *Syzygy*, from Bet Hall of 37 Caxton Close, Hartley, Dartford, Kent DA3 7DG. There must be something in the Kent air, as Bet, like Philip Blazdell, has completed a vast number of adventures. Her advice on *Syzygy* will have to be printed forwards as it's quite long, but because so many of you have written in to ask how to kill the Darth Vader figure I don't imagine you'll mind. Bet says you have to release the fuzzy to kill the huge alien in order to get the light sabre. Then you can go back to the computer to release Darth Vader for a practice battle, but by plunging in at the deep end and going for him straight away Bet managed to kill the Dark Lord at the third attempt. Just to prove it wasn't a fluke, though, she went back and did it another five times. She warns that you haven't seen the last of him, however, but if anyone's really stuck at the first hurdle then send Bet a tape with a saved game on and she'll progress it through for you. Don't forget to also send a jiffy bag with sufficient postage for Bet to return the tape to you, otherwise she has my express permission to ignore you, so there.

Philip Dooley of Cheshire starts his letter by saying that I've got a lot to answer for. What can this be? An incorrect clue, or recommending a duff adventure? No, it's just that about 12 months ago Philip was quite happy enough playing *Donkey Kong*, *Chuckie Egg* and others, but then he started reading the adventure column and thought he'd give them a try. Since then, total addiction, many sleepless nights and a distinct cash problem, not to mention woman trouble in *Shenanigans and Sea Quest*. I've sorted out Philip's woman trouble for him, but can't do much about the addiction, I'm afraid. Perhaps this column should just carry a government health warning, that reading it can seriously damage your sanity.

That must be what's happened to Dave Halliwell of Birkenhead, who wrote to say he's having trouble with that well-known adventure, *The Clog-Dancing Shepherds of Milton Keynes*. Dave says he's managed to get the long-life milk from the concrete cows, and has made some cement with it, but doesn't know what to do with the cement or how to get rid of the town full of Zombies. He says he's also found the photo of Mrs Thatcher but can't locate the matches or sickness tablets. This column being politically neutral, I can't say whether he's on the right lines with that last one. But thanks to Dave for a letter which was certainly different and gave me quite a laugh.

Always end on a good note, they say, so for all of you who have written over the past few months to ask if we'll ever see a version of the infamous *Colossal Cave Adventure* on tape for the Dragon, apart from the disk version from Compusense, well, good news could be on the way. A machine code version, only slightly abbreviated, has been produced by a company called Cowen Software from Manchester, using their own machine code adventure writing utility. At the moment the company's trying to see if one of the larger Dragon software houses will publish it, but failing that then they'll do it themselves, and having seen a preliminary version of the game I'm sure it will appeal to lots of Dragon adventurers. I won't be reviewing it till I can tell you where you can buy it, and for how much, but if you're at all interested then there's only one thing to do, as usual . . . watch this space.

Adventure Contact

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Problem..
....
Name ....
Address..
.... **Jan 86**

Adventure Contact

Adventure: Pettigrews Diary — London Frolics. **Problem:** How do you get to meet someone in the hotel? And where's the code for Island Hut? **Name:** Rikkie Proost. **Address:** 19 Tregoning Street Linksfield, Johannesburg, 2192, South Africa.

Adventure: Return of the Ring. **Problem:** I am at Level 16 with 60000 experience and have completed all quests, I even have the Time Ring but what do I do next? Help! **Name:** Rafe Rainbird. **Address:** Room 201, Agnes Westons, Albert Road, Devonport, Plymouth, Devon.

Adventure: Return of the Ring. **Problem:** How do I get the genie and glass? What is the use of the Glass? **Name:** David Eggleden: **Address:** 9 Tithe Road, Chatteris, Cambs, PE16 6SL.

Adventure: Madness and the Minotaur. **Problem:** How do I get the torch and can I have the hint sheet please? **Name:** David Gill. **Address:** 11 Aldersleigh Drive, Wildwood, Stafford, ST17 4RY.

Adventure: Return of the Ring. **Problem:** Walked on Forest Moon but can't do anything that's useful — help! **Name:** David Hunt. **Address:** 16 Harfield Gardens, Grove Lane, Camberwell, London SE5 8DB.

Adventure: Shenanigans. **Problem:** How do you get out of the city at the start? I am stumped. **Name:** Paul Houghton. **Address:** 5 The Parklands, Heaton Norris, Stockport, Cheshire, SK4 1QZ.

Adventure: Manic Miner. **Problem:** Mutant Telephones. **Name:** Guy Hunter. **Address:** 28 Lyon Street, Bognor Regis, West Sussex.

Adventure: Return of the Ring. **Problem:** In the House of Quests in the Forest, what is stone? How do you get the key from the genie? **Name:** Mark Hayward. **Address:** 5 Burden Close, Bodmin, Cornwall, PL31 1NY.

Adventure: Mansion of Doom. **Problem:** How do I get across the deep pool of acid that blocks my path to the coffin? **Name:** Marcus Browning. **Address:** 47 Oaks Drive, Higham Ferrers, Northants, NN9 8EX.

Adventure: Return of the Ring. **Problem:** Where is the Travel Unit? Can't find Gron. Will offer help on the Genie, Halm's Temple, Book of Skulls. **Name:** Paul Bryant. **Address:** 1 Claremont Villas, Tamworth Road, Furnace End, Birmingham, B46 2LG.

Adventure: El Diablero. **Problem:** How do you kill the Eagle? What do you with the Magic Bush? **Name:** S. J. Gamble. **Address:** 39 Plaistow Avenue, Hodge Hill, Birmingham, B36 8HQ.

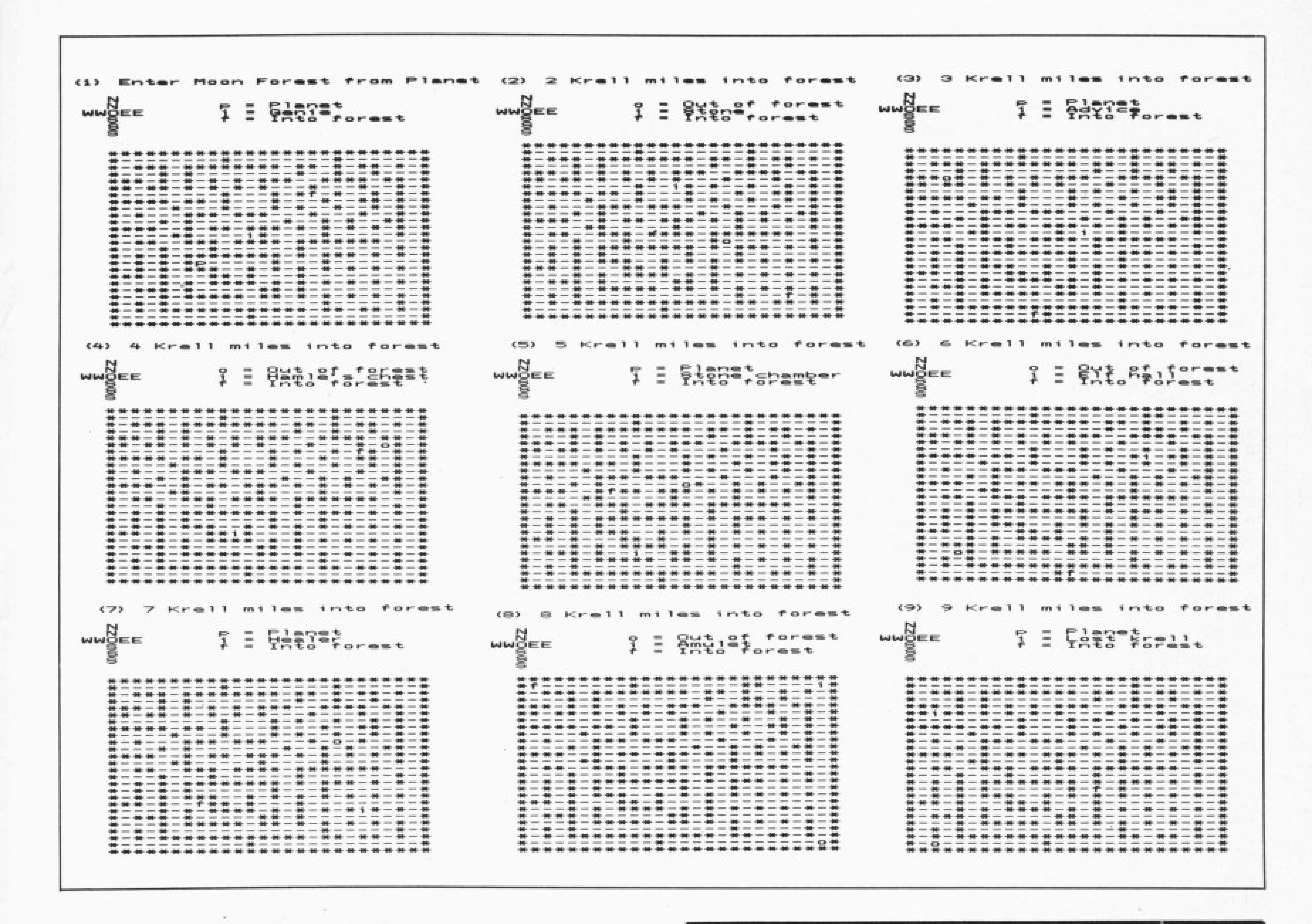
Cheat Sheet!

HAVING SPENT many frustrated hours struggling to overcome the Powers of Darkness to be found in the Return of the Ring, here is some information that may be of use to other Ring fanatics having similar nightmares.

First the maps of the Moon forests: there are levels of forest, the "maze" pattern being the same in each, the locations of the transporters being different at each level. I have not indicated all of the benefits to be gained in the "Interesting Places", as I feel that this would spoil the spirit of the game for the true adventurer.

For the adventurer with less moral fibre, the "cheat" program modifies the "Save" tape to increase the player's status. Modification to the number of regenerations has been deliberately omitted, as anyone unable to make rapid progress with an infinite supply of credits, crystals, and food deserves to meet with an untimely end!

```
10 CLEAR200,25672
20 DIM N$(9):N$(1)="NAME":N$(2)="STRENGTH":N$(3)="CHARISMA":N$(4)="INTELLIGENCE"
:N$(5)="EXPERIENCE":N$(6)="STAMINA":N$(7)="CREDITS":N$(8)="CRYSTALS":N$(9)="FOOD
"
30 CLS0:PRINT@42,"cheat";CHR$(128);"program";
40 PRINT@111,"for";
50 PRINT@165,"the";CHR$(128);"return";CHR$(128);"of";CHR$(128);"the";CHR$(128);"
ring";
60 PRINT@239,"by";
70 PRINT@299,"robin";CHR$(128);"beard";
80 FOR T=1 TO 3000:NEXT
90 CLS:PRINT@68,"PREPARE YOUR 'SAVE' TAPE"
100 PRINT@139,"FOR LOADING"
110 PRINT@195,"PRESS ANY KEY WHEN READY":MOTORON
120 A$=INKEY$:IF A$<>"" THEN MOTOROFF ELSE 120
130 CLS:PRINT@171,"PRESS 'PLAY'":PRINT@263,"THEN PRESS ANY KEY"
140 A$=INKEY$:IF A$<>"" THEN CLOADM"X" ELSE 140
150 IF PEEK(110)=0 THEN SOUND 200,1
160 CLS:PRINT@8,"YOUR STATUS IS:-"
170 PRINT:PRINT" 1 NAME: ";:FOR I=25684 TO 25698:PRINTCHR$(PEEK(I));:NEXT
180 PRINT:PRINT" 2 STRENGTH:          ";PEEK(25740)
190 PRINT" 3 CHARISMA:          ";PEEK(25741)
200 PRINT" 4 INTELLIGENCE       ";PEEK(25742)
210 PRINT" 5 EXPERIENCE:        ";PEEK(25710)*256+PEEK(25711)
220 PRINT" 6 STAMINA:           ";PEEK(25700)*256+PEEK(25701)
230 PRINT" 7 CREDITS            ";PEEK(25726)*256+PEEK(25727)
240 PRINT" 8 CRYSTALS:          ";PEEK(25736)*256+PEEK(25737)
250 PRINT" 9 FOOD:              ";PEEK(25702)*256+PEEK(25703)
260 PRINT" 10 SAVE NEW STATUS"
270 PRINT:PRINT" WHICH WOULD YOU LIKE TO CHANGE  (ENTER NUMBER)";:INPUT X:IF X<0
 OR X>10 THEN CLS:PRINT"  REPEAT":GOTO170
280 ON X GOTO 300,360,410,460,510,560,600,640,680,720
290 GOTO 170
300 GOSUB 800
310 PRINT" (NOT MORE THAN 15 LETTERS)":FOR I=25684 TO 25698:POKE I,0:NEXT
320 INPUT NA$:IF LEN(NA$)>15 THEN PRINT"    TOO MANY LETTERS":GOTO300
330 IF LEN(NA$)>15 THEN PRINT"  TOO MANY LETTERS":GOTO300
340 FOR I=1 TO LEN(NA$):POKE25683+I,ASC(MID$(NA$,I,1)):NEXT
350 GOSUB810:GOTO170
360 GOSUB800
370 PRINT" (10 TO 40)":INPUT SG
380 IF SG<10 OR SG>40 THEN PRINT" WRONG ENTRY":SG=0:GOSUB820:GOTO170
390 POKE 25740,SG
400 GOSUB810:GOTO170
410 GOSUB800
420 PRINT" (10 TO 40)":INPUT CH
430 IF CH<10 OR CH>40 THEN PRINT" WRONG ENTRY":CH=0:GOSUB820:GOTO170
440 POKE 25741,CH
450 GOSUB810:GOTO170
460 GOSUB800
470 PRINT" (10 TO 40)":INPUT IN
480 IF IN<10 OR IN>40 THEN PRINT"WRONG ENTRY":IN=0:GOSUB820:GOTO170
490 POKE25742,IN
500 GOSUB810:GOTO170
510 GOSUB 800
520 PRINT" (60000 MAXIMUM)":INPUT EX
530 IF EX>60000 THEN PRINT" TOO MUCH":EX=0:GOSUB820:GOTO170
540 POKE 25710,INT(EX/256):POKE 25711,EX-PEEK(25710)*256
550 GOSUB810:GOTO170
560 GOSUB800
570 INPUT ST
580 POKE 25700,INT(ST/256):POKE25701,ST-PEEK(25700)*256
590 GOSUB810:GOTO170
600 GOSUB800
610 INPUT CT
620 POKE 25726,INT(CT/256):POKE 25727,CT-PEEK(25726)*256
630 GOSUB 810:GOTO170
640 GOSUB800
650 INPUT CY
660 POKE 25736,INT(CY/256):POKE25737,CY-PEEK(25736)*256
670 GOSUB810:GOTO170
680 GOSUB800
690 INPUT FO
700 POKE25702,INT(FO/256):POKE25703,FO-PEEK(25702)*256
710 GOSUB810:GOTO170
720 CLS:PRINT@68,"PREPARE YOUR 'SAVE'TAPE"
730 PRINT@140,"FOR SAVING"
740 PRINT@196,"PRESS ANY KEY WHEN READY":MOTORON
750 A$=INKEY$:IF A$<>"" THEN MOTOROFF ELSE 750
760 CLS:PRINT@133,"PRESS 'SAVE' & 'RECORD'
770 PRINT@199,"THEN PRESS ANY KEY"
780 A$=INKEY$:IF A$<>"" THEN CSAVEM"X",25673,29472,25673 ELSE780
790 END
800 CLS:PRINT" ENTER NEW "N$(X):RETURN
810 CLS:PRINT"  YOUR NEW STATUS IS:-":RETURN
820 FOR T=1 TO 1000:NEXT:GOSUB810:RETURN
```



(1) Enter Moon Forest from Planet
p = Planet
i = Genie
f = Into forest
(2) 2 Krell miles into forest
o = Out of forest
i = Stone
f = Into forest
(3) 3 Krell miles into forest
p = Planet
i = Advice
f = Into forest
(4) 4 Krell miles into forest
o = Out of forest
i = Hamlet's chest
f = Into forest
(5) 5 Krell miles into forest
p = Planet
i = Stone chamber
f = Into forest
(6) 6 Krell miles into forest
o = Out of forest
f = Into forest
(7) 7 Krell miles into forest
p = Planet
i = Healer
f = Into forest
(8) 8 Krell miles into forest
o = Out of forest
i = Amulet
f = Into forest
(9) 9 Krell miles into forest
p = Planet
i = Lost Krell
f = Into forest

The Dragon means business

***Brian Cadge** examines a suite of professional business programs*

THE ROLE of the Dragon in the UK market as far as games are concerned must now, sadly, be at end. If the Dragon is to survive here it will be as a complete introductory system to professional software. This, it seems, is the view taken by London-based Compusense, who are committed to the Dragon computer with the FLEX and/or OS-9 Operating System.

Compusense are now marketing a complete set of small business packages to run under the OS-9 Operating System. The packages are in two volumes. Volume one contains Invoicing and Stock Recording and volume two contains Sales Ledger, Purchase Ledger and Labelling.

All the programs are intended to make up an integrated set and some share common files (such as the 'Item File'). The programs were originally coded in BASIC-09, which is also available for OS-9, and were marketed by Dragon Data. However, almost before they were released Dragon Data went down and the rest is history.

Each individual program of the package is on a separate disk, making a total of five disks for the two volumes. Running any of the programs requires the OS-9 system disk to be booted and the RUN51 command to be entered. This sets up the 51-column display and loads in the BASIC-09 run-time package. Instructions are then displayed to change the system disk for the program disk, the particular program then autoruns.

An unfortunate feature of all this is that to change from one program to another, for example from the Sales Ledger program to the Invoicing program, the machine has to be turned on and off and the system rebooted. It is not possible to swap programs from within the package, and even using the 'Closedown' option, which returns the OS-9 command prompt, does not help as reusing the RUN51 program tends to be unreliable. To be fair this is probably more the fault of OS-9 rather than the software, and the same package running under FLEX would not have such problems.

All of the programs are menu driven and use the 'form-fill' approach to entering data. Sensibly, all of the programs use the same format, and the first thing that greets you after a fair amount of disk activity is a main options menu.

The first thing to be done with each package is the setting up of your companies particulars. The program allows you to specify a company name, address, telephone number, VAT rate and so on, as well as allowing automatic linking to other packages, such as the Sales Ledger and Stock Recording from within, for example, the Invoicing system.

Briefly the various programs in the package allow you to do the following. The Stock Recording system allows Transactions to be entered as either sales, requisitions, returns, or scrapped, for transactions issues, and for receipts as either purchases, returned requisitions, or returned sales. Once the files are set up they can be changed at the individual record level, or at the product group level. There are also quite sophisticated enquiry options. The transaction entry format is the same for all types and again is form-fill.

The Stock Recording system offers a number of reporting facilities, including stock listings and valuation, a listing of slow moving items, a re-order list, and usage history of items. Simple transaction listings can also be produced by either item, or transaction type. The reports are output to the printer. The system menu allows selection of either single sheet feed (for daisy wheel), or continuous feed (for fast matrix).

The purpose of the stock recording system is really to maintain quite sophisticated records of stock and to provide genuinely useful file enquiry and statistic options.

The Invoicing system allows the entering of all invoicing details. The Customer file can be copied across from the disk used for Sales Ledger and invoicing details can also automatically be 'posted' to the Stock Recording and Sales Ledger programs. This is available on a single drive system, but requires a fair amount of disk swapping. It is made much simpler by the use of a double disk system.

The invoices file can be as long as there is disk space, and can contain any number of entries for each invoice for a particular customer. Again all entry uses the form-fill approach with the lack of dynamic editing. The 'Item File' is also maintained by the Invoicing system. This contains an item number, description, sale price, and unit of measure (such as 'each' or 'per foot') for each product of the company.

Printing Invoices is quite straight forward. Following yet another on screen menu, the user may select either plain or company headed paper, choose to print only those invoices previously unprinted, and to start and finish at particular invoice numbers.

So much for volume one of the software; volume two contains three disks — sales and purchase ledgers and labelling. The sales ledger program is based on a Financial Year of 12 periods, each either a calendar month or other period to suit the user. The programs use the OS-9 system date as the default, and also check that any other dates entered are reasonable compared to this.

Two files are used by the Sales Ledger system — the Customer Account file, and the Transaction File. The program allows the recording and audit of transactions made between the company and customers, as well as providing VAT information and the usual file interrogation facilities. A certain amount of credit control is also available through Debt Ageing and Credit Limits.

Enquiry options include the ability to list all overdue accounts, accounts whose credit limits have been exceeded, as well as company ledger summaries and company turnover analysis.

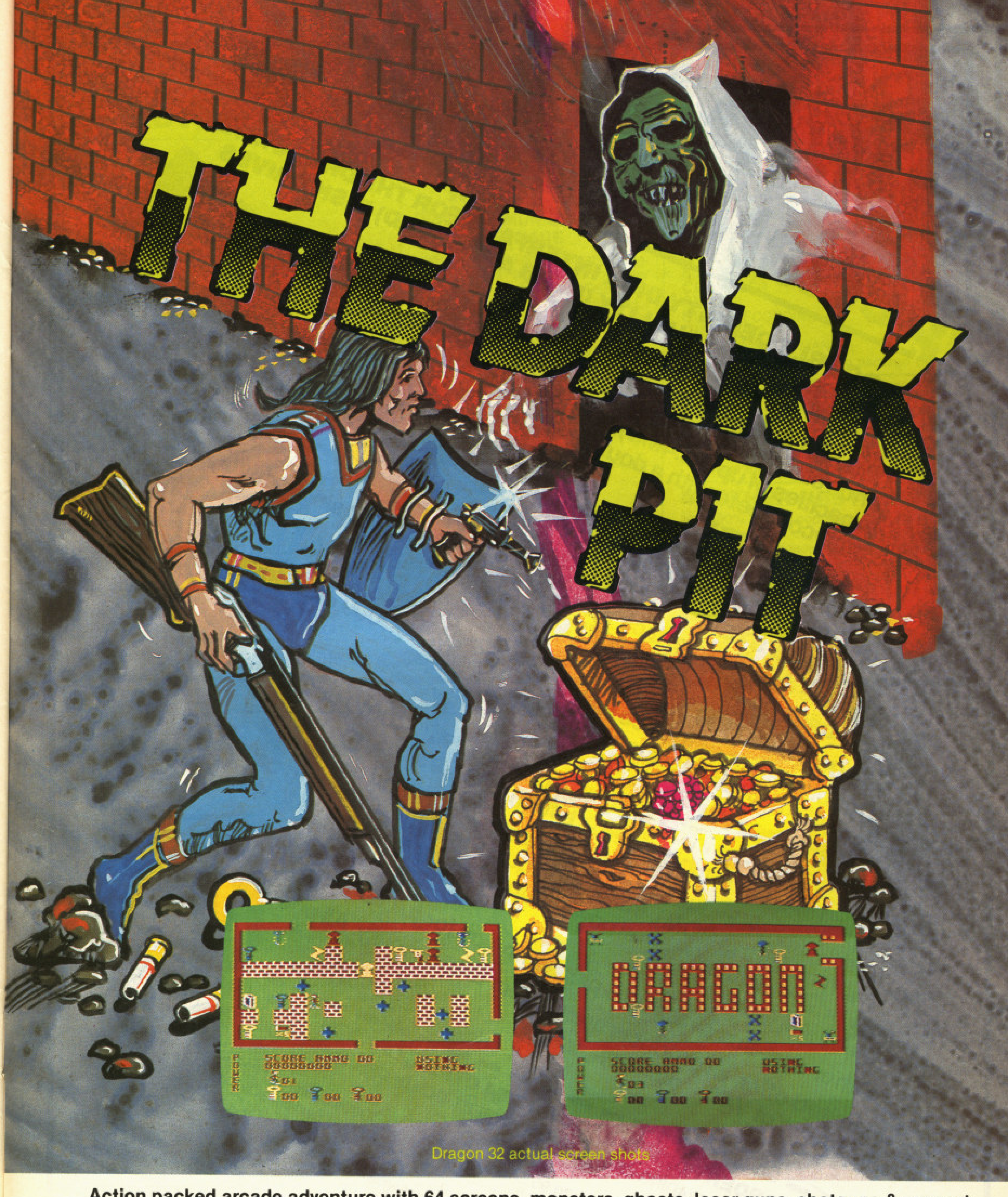
The Purchase Ledger system uses exactly the same approach as the Sale Ledger system. In addition, cash flow analysis and report facilities are available. Three files are used by the system. These are the Supplier account, the Transaction file, and the Analysis Code file. This last file contains details of the codes used within the system for analysing purchases. Some of the codes are preset to useful values, such as 10 = rent, 40 = legal expenses, but all 100 codes can be changed by the user.

Finally, the labelling system performs a fairly obvious task. The system uses only one file, the Labelling Account file, but data can also be taken from the Sales Ledger, Purchase Ledger, and Invoicing Systems. Labels can be printed selectively by category if printed from the internal Labelling Account file. The various parameters for the label types may be set up, allowing different sizes of labels.

As a complete system, this package seems really suited to the small- to medium-sized business. All interaction is via clear menus and form-fill. Excellent use is made of the OS-9 51-column display throughout. It is nice to see a package written specifically for the Dragon under OS-9. The big criticism I have to make concerns the Break key. This is all too easy to press, and if you do you are met by an error message and the OS-9 prompt. There is no way to get back to the package except to reboot, and the files may have been left in an indeterminate state. The need for regular backups is obvious. Having said that, the system performs excellently otherwise, if you can stand the rather long periods of disk activity between some options as programs are swapped in and out. Again, this is really the fault of OS-9, and not the package itself.

I have only skimmed the surface of the facilities offered by the various programs. An in-depth look at each would simply be re-writing the excellently laid out manuals, and would serve little purpose.

This is a very professional package, and really marks the way forward for the future of the Dragon 64 in the UK.



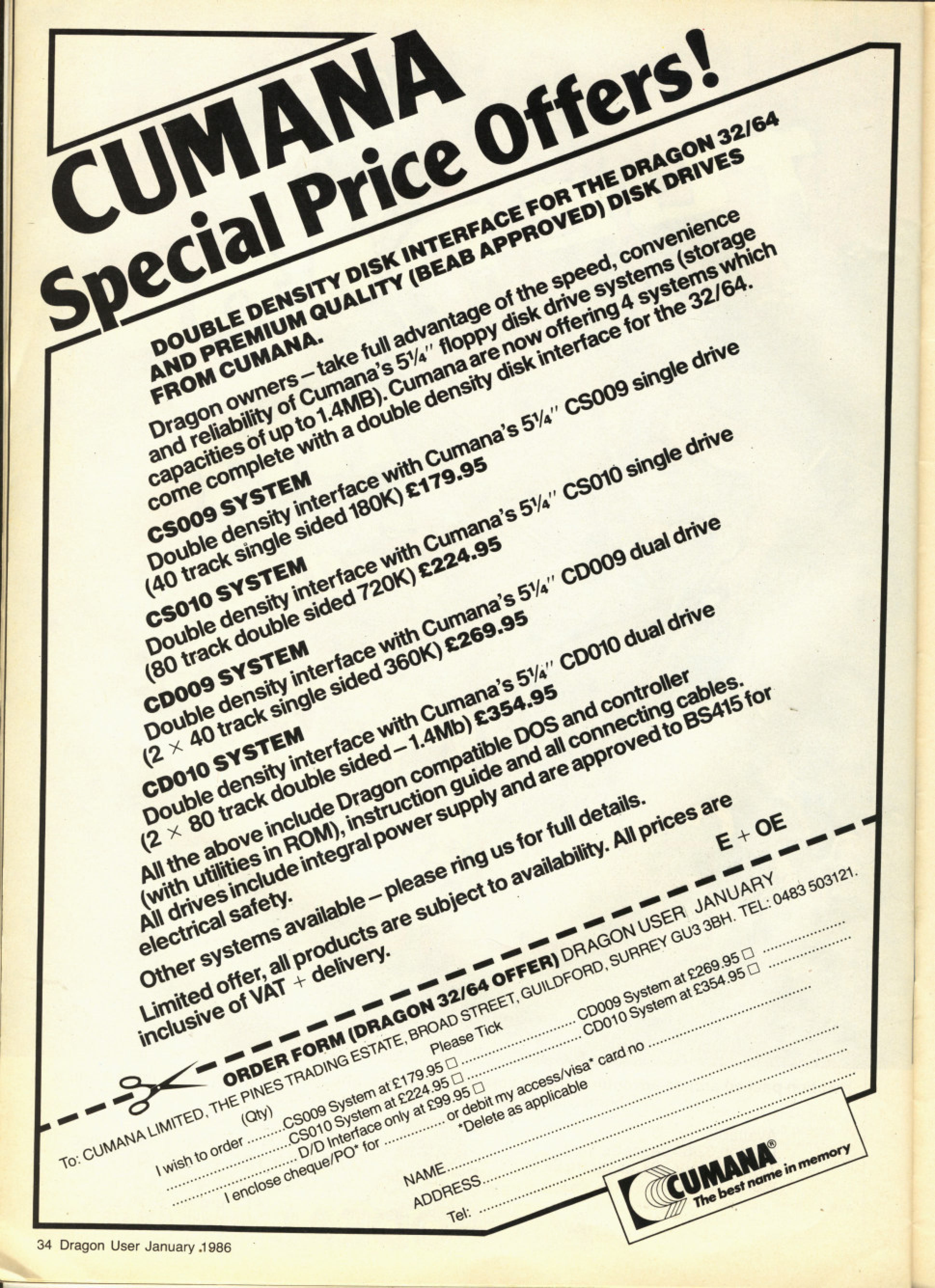
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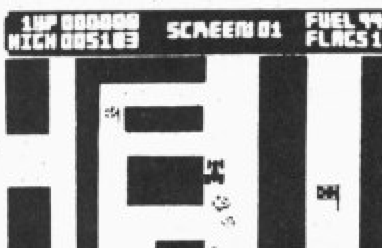
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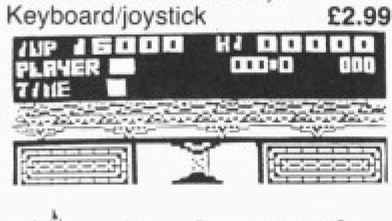
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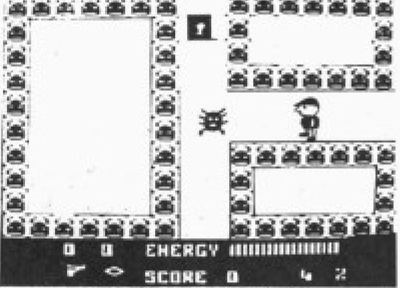




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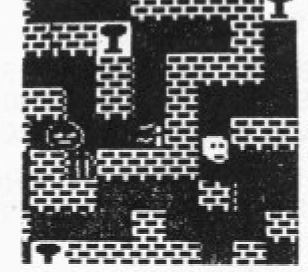
SEWER RATS

Get to the Sewer Exit before the demon infested sewers get you. Lay traps — beware of the Sewere Gas.

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Missing Memory

I HAVE purchased a 64K Dragon computer and on Print Mem the computer shows only 32K, could you tell me how I get to the other 32K? Secondly I am in the process of developing some hardware, and would like to know which pins on the 6809e microprocessor correspond to Ø2 clock and VMA as on the 6800.

Mr Mark Brooke
'The Knowle'
25, Bings Road
Whaley Bridge
Nr. Stockport
Cheshire

THE ANSWER to your first question is simple, just type EXEC immediately after power up. Although the 6809e can interface with all 6800 peripherals and is upwardly software compatible, the pin outs of the two CPUS are not identical. The 6800's 'Ø2' connection (pin 37) is similar to the 6809's 'E' connection (pin 34). The 6800's 'VMA' (pin 5) stands for 'Valid Memory Address' and goes high when the address bus is valid. There is no direct equivalent on the 6809 — the address bus is valid on the leading edge of the 'Q' (pin 35) timing signal. Note that 'Q' is not the same as 'Ø1' on the 6800.

Disc Commands

I HAVE just purchased a Dragon Data disk drive unit but find the accompanying manual a little vague!

Can you tell me how to convert saving and loading data routines from tape to disk? I have tried using FWRITE, FREAD, FLREAD, and SWRITE without success. My main use is with a standard database programme and I wish to save and load data on to disk instead of tape.

John Booth
Aylesbury
Bucks.

THE MOST common cause of confusion in this area is the FWRITE command. Unlike PRINT #-1 it does not automatically include commas between data items. For most programs the following conversions will work:

Cassette Command
1) OPEN "I",-1,"filename"
2) OPEN "O",-1,"filename"
3) INPUT #-1,A,B,A$
4) LINE INPUT #-1,A$
5) PRINT #-1,A,B,A$
6) EOF (-1)
7) CLOSE #-1

Disk Command to Substitute
1) FN$="filename"
2) FN$="filename"
3) FREAD FN$;A,B,A$
4) FLREAD FN$;A$
5) FWRITE FN$;A,",",B,",",A$
6) EOF (FNS)
7) CLOSE



Man of Letters

I WAS wondering if you can help me on a problem that has arisen in respect of The Dragon and OS-9.

The problem is that I would like to have a disk for the 'spellcheck' utility but I find, even following all the instructions in the OS-9 guide, I cannot delete files not associated with Spellcheck.

Greg Holmes
St Thomas' Hospital
London SE1

THE SPELLCHECKER program is certainly worth putting on a separate disk, the following procedure will produce a working Spell Disk:

1: From the OS9 disk use LOAD to load MAKDIR,COPY,BUILD
2: Format a blank disk
3: With the blank disk in drive type MAKDIR CMDS followed by MAKDIR STY
4: Create a file SUPP containing any one word using the BUILD /DO/STY/SUPP command.
5: Insert the Stylograph disk and copy the following:

```
COPY /DO/CMDS/SPELL /DO/CMDS/SPELL -S #32K
COPY /DO/STY /DICT /DO/STY/DICT -S #32K
COPY /DO/CMDS/COPY /DO/CMDS/COPY -S #32K
COPY /DO/CMDS/DEL /DO/CMDS/DEL -S #32K
COPY /DO/CMDS/RENAME /DO/CMDS/RENAME -S #32K
```

Track Trouble

COULD YOU please tell me why the command DSKINIT 1,1,80 does not set up a 90 TPI disk with 80 tracks? I own the double disk drives with the Dragon DOS manafactured by Dragon Data.

Mr T Robinson
112 Threefields
Ingol
Preston
Lancashire

THE DRAGONDOS cartridge can support 80 track drives, but to format a disk to 80 tracks you must have an 80 track drive connected. The standard Dragon Data drives are only 40 track and can only format up to 40 tracks regardless of the type of disk used. It is not advisable to use the DSKINIT command as you describe as this could potentially damage the 40 track drives.

Sprites

I HAVE been writing a game in machine code which uses 'sprites' produced by using 'exclusive oring' (EOR instruction). But no matter how fast I update the characters they always seem to flicker can you suggest why?

Phil Parkes

THE REASON for the flickering graphics is that you are not syncronizing the drawing and undrawing of the graphics to the Cathode Ray Tube of your TV.

If you 'move' the graphics whilst the screen is not being drawn (during the 'Frame Flyback' of the TV) then the picture will not flicker. This is simple to achieve by adding the following few instructions before your routines to update the screen;

```
WAITTV LDA $FF03
       ANDA #128
       BEQ WAITTV
```

What this does it to wait until bit 7 of location $FF03 is high — this is the 'Field Sync Interrupt Flag' and goes high when the CRT has finished drawing a screen and is returning to the top of the screen.

Hi-rise

IS THERE any way of loading a Basic program (eg a dissassembler) above a machine code program? I have tried POKEing 25 to 28 with a higher address but get SN error when trying to RUN the Basic, whilst resetting POKEs 25 and 26 with their original address loses the Basic.

Incidentally, I have discovered a function of the Editor not mentioned in the manual. Typing a numer 'n' and 'spacebar' moves the cursor n characters along the line being edited.

Brian Beesley,
Eastleigh.

TO LOAD a Basic program above a machine code program I suggest you do the following:

Use the CLEAR statement to set top of RAM (eg CLEAR 200, &H3FFF). Now load the machine code at &H4000 upwards, then POKE 25 and 26 with the first free byte available after your machine code. Type in CLOAD. Locations 27 and 28 will now be the right values.

The reason for the SYNTAX ERROR on RUN is that the first byte of Basic must always be 0. Therefore you should find the first free byte of Basic and POKE it with 0.

However, please note that if the program uses variables, these variables will be stored at locations pointed to by 29 and 30. If 29 and 30 point to just beneath your machine code program or any other storage area, the program may be overwritten by the variables.

Firmware

Brian Cadge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

This month we cover the control of Basic variables (simple numeric and strings). This information will be of use mainly to the programmer who wishes to add new commands/USR routines to Basic.

Variables Memory Map

THE FOLLOWING locations are used by Basic for storing information regarding the state of numeric and string variables. It is not advisable to change the contents of these addresses from Basic, although they may be PEEKed where useful.

- 6 Variable Type Flag. Signifies the type of variable encountered; this is 0 for numeric and 225 for string.
- 27/28 Start address of simple variables table in RAM. See below for an explanation of the format of this table.
- 29/30 Start address of array table in RAM.
- 31/32 End of storage in use. This points to the last byte being used by Basic.
- 35/36 Top of free string space. Note that by subtracting the contents of 33/34 from this you can obtain the amount of free string space left and so prevent OS errors.
- 49/50 Line number of current Data statement.
- 51/52 Address of next item in the current Data statement.
- 55/56 Pointer to variable last in use.
- 57/58 VARPTR address of variable last in use.
- 79–84 Floating Point Accumulator number one.
- 82/83 Part of FPA1 used in assignment of 16 bit variables and strings.
- 92–97 Floating Point Accumulator number two.

The VARPTR address of a variable points to the five bytes which hold the numeric value of that variable, or point to the start address of a string. It is the same address returned by the Basic VARPTR command.

The format of the variable table is as follows. Each variable entry takes up seven bytes. The first byte is always the ASCII code of the first character of the variables' name. The second byte is the ASCII code of the second character of the variables' name, or zero if the name is only one character long. For a string variable bit 7 of this byte is set (ie has 128 added to it).

The next five bytes depend on whether the variable is string or numeric. Numeric variables are stored with their binary exponent in the first byte, followed by the value of the mantissa. The most significant bit of the mantissa is set if the value is negative. For a string variable, the first of the five bytes contains the length of the string (0–225) and the third and fourth point to the start address of the string, which may be either in the program area (for constants) or in string space.

A simple way of adding commands to basic is to use the EXEC command followed by a number of parameters, if the address of the routine is stored in a variable. For example, 'SAY' if the command was to control a speech synth the format could be: EXEC SAY,A$,3

The first part of the routine needs to call the CKcoma routine to skip the comma after the routines address, and from there on all the routines used by normal basic commands to evaluate strings and numbers can be used on the parameters given.

Firmware Routines for Variables

The following routines can be used for creating, accessing and deleting variables. All addresses are in decimal and are given for both the Dragon and Tandy machines.

GetExpr Dragon 34935 Tandy 45382
This routine will evaluate and put the VARPTR address of the expression which follows into locations 82/83.

GetStrg Dragon 34951 Tandy 45398
Compiles a string and places it in some free string space. This routine should normally be followed by a call to GetExpr to get the address of stored string.

CKcoma Dragon 35242 Tandy 45677
Reads in the next significant character on the command line, and checks that it is a comma. If it is not then a Syntax Error is produced, otherwise the routine simply returns.

CKclbrak Dragon 35236 Tandy 45671
As for CKcoma, but checks for close bracket character ')'.

CKopbrak Dragon 35239 Tandy 45674
As for CKcoma, but checks for open bracket character '('.

CKchar Dragon 35244 Tandy 45679
As for CKcoma, but checks for the character in the B register.

GetVar Dragon 35476 Tandy 45911
Gets the VARPTR address of the following variable name (not expression), and places it in locations 57/58. The variable type is placed in location 6.

GetUSR Dragon 35625 Tandy 46057
Returns the value of the argument given in a USR function as a 16 bit number in the D register.

Assign-8-bit Dragon 35894 Tandy 46323
Assigns the value in the B register to a numeric variable. This routine also returns to the basic processing loop and so should be entered at the end of a function routine, or USR routine, using a JMP.

Assign-16-bit Dragon 35893 Tandy 46322
Assigns the value in the D register to a numeric variable. Entry conditions are otherwise as for Assign-8-bit.

Assign-16-bitB Dragon 39998 Tandy 34830
An alternative routine to Assign-16-bit. This assigns the value in locations 82/83 to a variable. Entry conditions are otherwise as for Assign-8-bit.

Garbage Collect Dragon 36055 Tandy 46481
Forces a controlled garbage collection of string space. This routine can be called from basic (EXEC) or machine code to control when the 'pauses' occur when using large volumes of string space.

DelVar Dragon 36255 Tandy 46681
Frees the space taken up by a variable. On entry the X register must point to the VARPTR of the variable to deleted.

Get-8-bit Dragon 36433 Tandy 46859
Returns the value of the following number in the B register. If the number evaluates to more than 8 bits then an FC error is produced.

Get-16-bit Dragon 36483 Tandy 46909
Returns the value of the following number in the X register. If the numer evaluates to more than 16 bits then an FC error is produced.

This is the fifth in Brian's series on the Dragon's Rom routines. Next month he will be covering Firmware Vectors.

If you have missed any of the previous issues, they can be obtained from Dragon User, Back Issues, 12-13 Little Newport Street, London WC2H 7PP, at £1.25 each, inclusive of postage, packing and administration charges.

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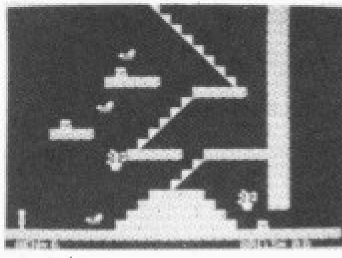
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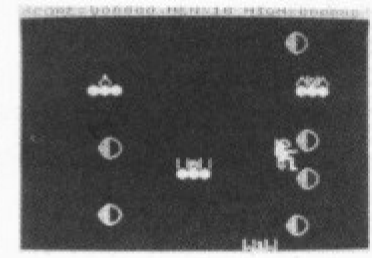
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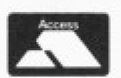
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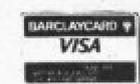
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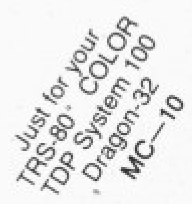
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Competition Corner

Answers to Competition Corner, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

WITH ANOTHER New Year upon us, here is a short routine which will display the calendar for any given month between the years 1800 and 2099. Simply input the year and month and leave the computer to do the rest. Readers with printers might like to adapt the program to print out the complete calendar for any given year.

The method on which this program is based is one that is found in a number of mathematical texts, and which calculates the day on which any given date falls. The method is as follows:

Take the last two digits of the year and add to it a quarter of its value (disregarding any fraction). Then add the month value from the table below:

Jan	+1 (leap year +0)	July	+0
Feb	+4 (leap year +3)	Aug	+3
Mar	+4	Sept	+6
April	+0	Oct	+1
May	+2	Nov	+4
June	+5	Dec	+6

Now add the day of the month that you are interested in, and finally add the 'century' value from the table below:

2000 — 2099	+1	1752 — 1799	+4
1900 — 1999	+0	1700 — 1752	+1
1800 — 1899	+2	1600 — 1699	+2

When you have the total, divide by seven and note the remainder. This will tell you on which day of the week the date fell (1 = Sunday, 2 = Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday and 0 = Saturday).

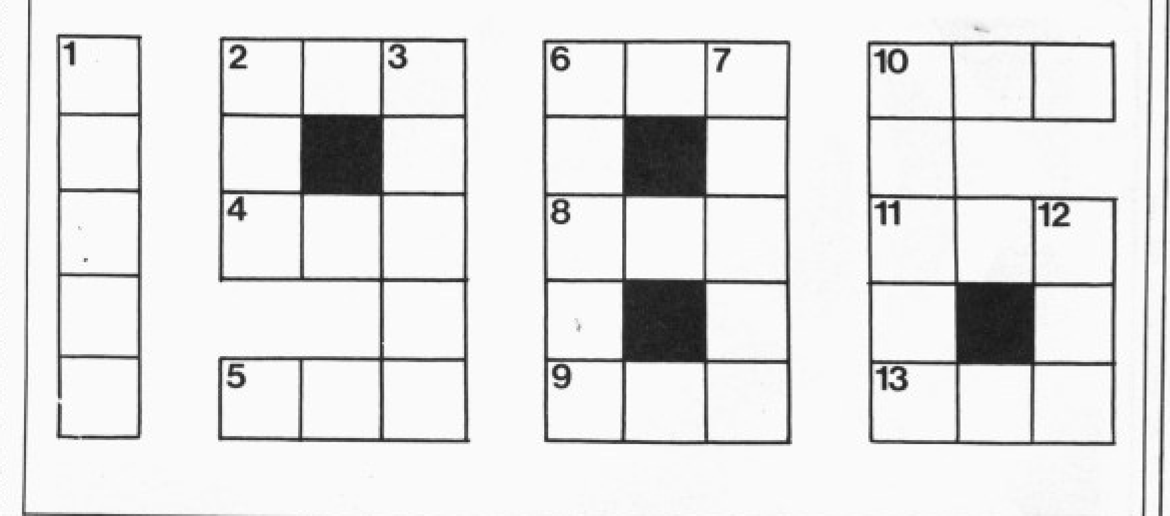
In the table for the month values, note that a different figure is to be added for the months of January and February for leap years only. A year is a leap year if it is exactly divisible by four. Unfortunately, there are exceptions to this rule. The 'idea' of the leap year was introduced in 46 BC by Julius Caesar when it was noted that their 365-day year was slowly regressing with regard to the seasons. (Unfortunately, the earth's stubborn refusal to orbit the sun in an exact number of days was the cause of this irregularity — and the addition of an extra day every fourth year helped to redress the balance!) This went fine until the middle of the 16th century when it began to be noticed that the equinoxes were occurring 10 days too late. In effect, the Julian year was still eleven minutes too long and the cumulative effect of this was to 'add' eight days every thousand years. In 1577 Pope Gregory XIII amended the leap year rule to say that the 'century' years, although by rights leap years, should *not* be regarded as such, but that the 'millennium' years (e.g. 2000) should be. If you find the effect of this 'fine tuning' confusing, let me add that the year is still too long by 26 seconds, so you may like to make a note in your diaries that the year 4000 will *not* be a leap year!

```
100 CLS
110 INPUT"ENTER YEAR";Y$
120 Y=VAL(Y$):IF Y<1800 OR Y>2099 THEN PRINT"YEAR OUT OF RANGE":GOTO 110
130 INPUT"ENTER THE MONTH (1 TO 12)";M
140 IF M<1 OR M>12 THEN 130
150 RESTORE:FOR F=1 TO M:READ M$,Q,L:NEXT F
160 R=VAL(LEFT$(Y$,2))
170 IF R=18 THEN Q=Q+2
180 IF R=20 THEN Q=Q+6
190 IF Y=1800 OR Y=1900 THEN 210
200 IF Y/4=INT(Y/4) AND M<3 THEN Q=Q-1:IF M=2 THEN L=29
210 Z=INT(VAL(RIGHT$(Y$,2))*1.25)+Q
220 IF Z>6 THEN Z=Z-7:GOTO 220
230 CLS:PRINT:PRINT@47-((LEN(M$)+5)/2),M$;Y
240 PRINT:PRINT"   S   M   T   W   T   F   S":PRINT
250 IF Z>0 THEN FOR F=1 TO Z:PRINT"    *";:NEXT F
260 FOR F=1 TO L
270 IF Z=7 THEN Z=0:PRINT:PRINT
280 PRINT USING"####";F;:Z=Z+1:NEXT F
290 IF Z<7 THEN PRINT"   *";:Z=Z+1:GOTO 290
300 GOTO 300
310 DATA JANUARY,1,31,FEBRUARY,4,28,MARCH,4,31,APRIL,0,30
320 DATA MAY,2,31,JUNE,5,30,JULY,0,31,AUGUST,3,31
330 DATA SEPTEMBER,6,30,OCTOBER,1,31,NOVEMBER,4,30,DECEMBER,6,31
```

This New Year competition is based on the crossword grid in the shape of the date '1986'. Can you select values for A, B, C, D and E, such that the expressions when evaluated will fit into the grid?

Across
- 2. D − C
- 4. D + B − A
- 5. D + A − B
- 6. A
- 8. A + B + C
- 9. D
- 10. B
- 11. C
- 13. A + C + D

Down
- 1. $E^3 - (A^2 + B^2 + C^2 + D^2 + E^2)$
- 2. $(D + A)/2$
- 3. $(D/2)^2$
- 6. B^2
- 7. A^2
- 10. C^2
- 12. E ★ 9



Prize

THIS MONTH we present a particularly seasonal offering, with a cross number puzzle in the shape of 1986. And up for grabs this time — 20 prizes of two cassettes containing a pot-pourri of programs from the Melbourne House book, Enter the Dragon. Should keep you occupied well into the New Year.

Rules

TO WIN this month's prize, all you have to do is send us the solution to the above crossnumber puzzle, using the printed clues — demonstrating how you solved it. Note — please don't send us cassettes containing your answer — hard copies only!

Make sure that your name and address is printed clearly on your entry, and mark your envelope 'December Competition' . . . or you run the risk of disqualification.

As a tie-breaker, complete the following sentence in 10 words or less: "1986 is the Year of the Dragon because . . . "

Entries must reach us by the last working day in February, with winners being announced in the April 1986 issue.

As usual, the Editor's decision is final, and no correspondence re the competition can be entered into.

Winners

The twenty winners of our October competition, who will be receiving copies of Manic Miner (courtesy of Software Projects) very soon are as follows:

R M Gosling of Alveston, P Robertson of Co Durham, G Davey of Gourock, Brian Hughes of Hounslow, E C Hasted of Erith, J J Isherwood of Dyfed, Rachel Edmunds of Sedgefield, R G Wilkinson of Warminster, Stephen Salvin of Telford, Ken Caldwell of Rugby, F J Taylor of Acklam, B M Chamberlain of Banbury, M McDonough of Fleetwood, A J Young of Dundee, I D High of Eltham, S P Barritt of Daventry, A Wilson of BFPO 106, R G Woods of Ilford, B Lewell of Nuneaton, P D Maddocks of Taplow.

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